Vol. XXVII. Part 2.

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The Journal of the Department of Agriculture of Victoria, Australia.

February, 1929.

PRINCIPAL CONTENTS

Milling and Baking Experiments with Crossbred Wheats

Contagious Abortion of Cattle

Milk Fever

A Gippsland Farm—Success on a Small Area

Water Supply for Farms—"Ironclad" or Artificial Catchment

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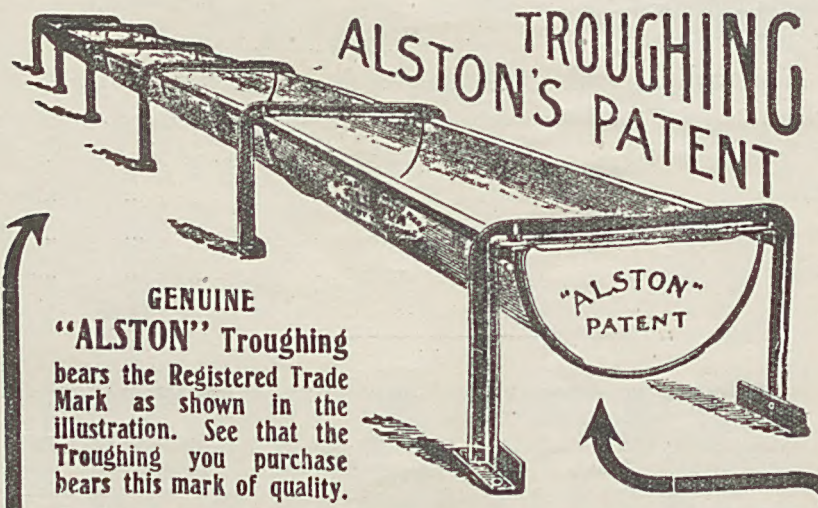

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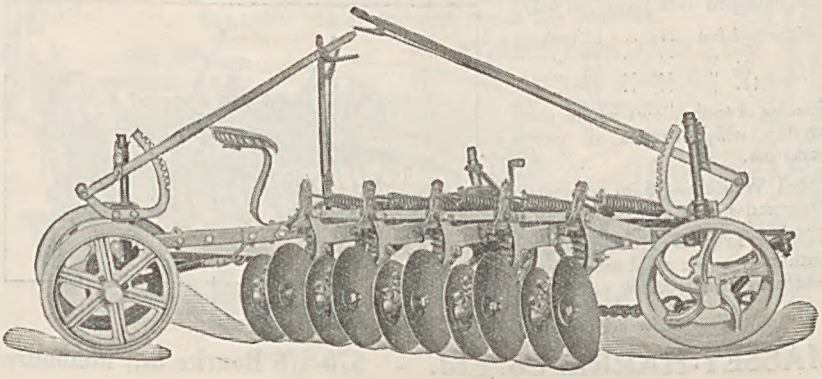

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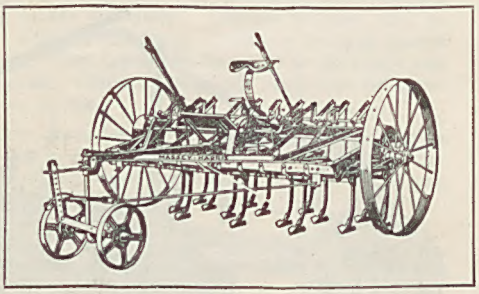

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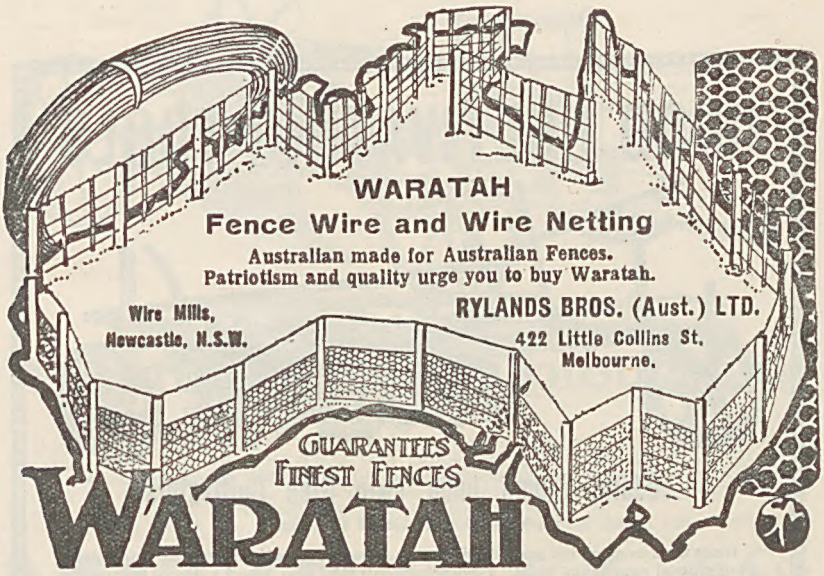

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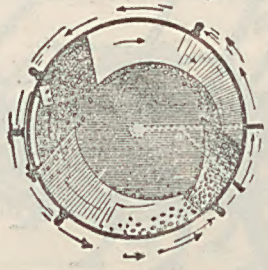

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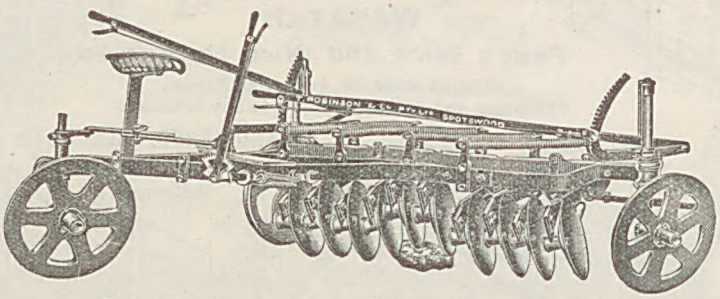

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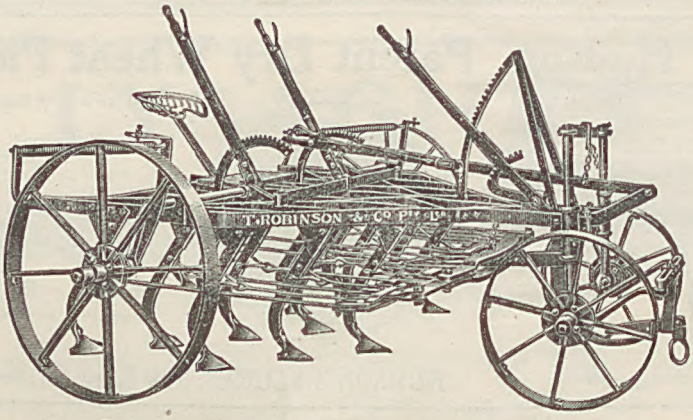

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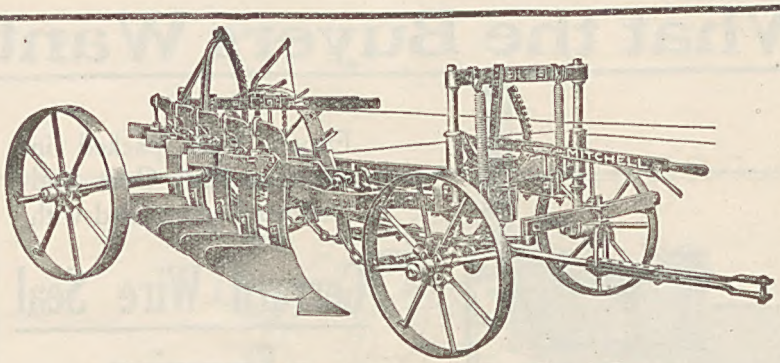

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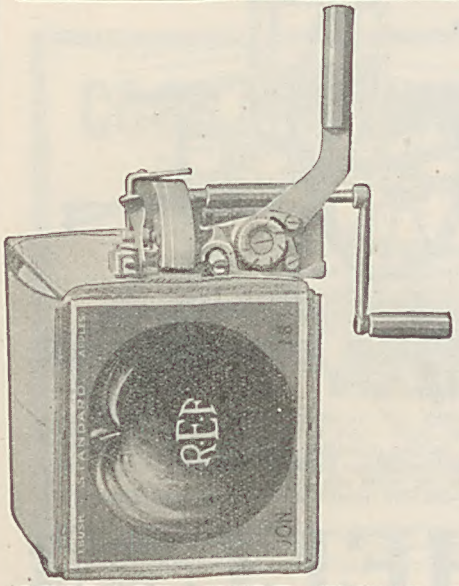

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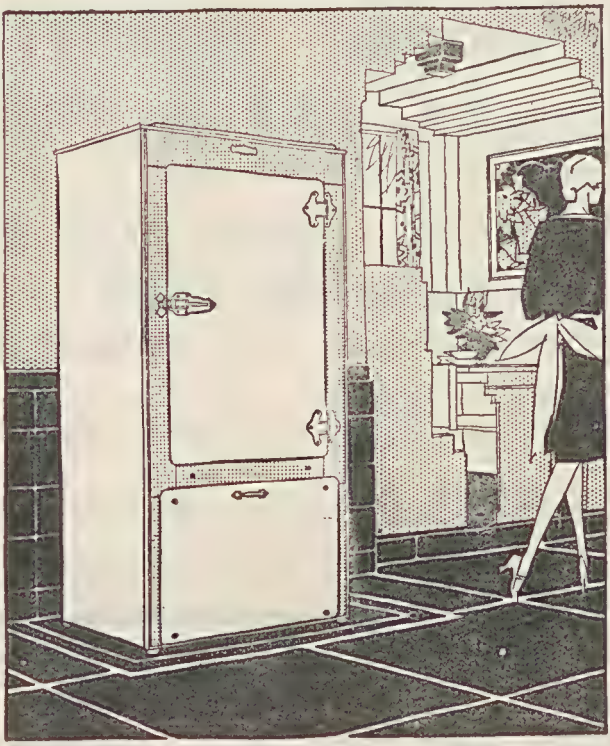

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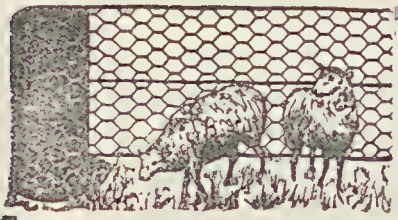

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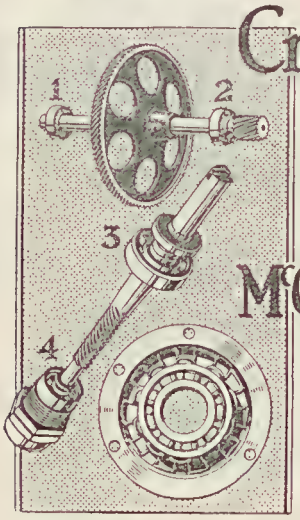

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THE JOURNAL

OF THE

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Vol. XXVII. February, 1929. Part 2

MILLING AND BAKING EXPERIMENTS WITH CROSSBRED WHEATS.

(W. R. Jewell, M.Sc., F.I.C., F.A.C.I., Research Chemist; and Mary Simpson, B.Ag.Sc., Cereal Chemist.)

Introduction.

When marketing wheat in this country, contrary to the practice with most other natural produce, quality is not of paramount importance. The value of fruit, butter, &c., is dependent on their respective qualities, and these products are therefore graded before marketing. Wheat, however, is sold on a f.a.q. basis, and as long as this method exists the farmer producing a high-quality wheat will not receive more than the grower who is concerned solely with quantity, and produces an indifferent sample. Naturally, under the f.a.q. system of marketing, the farmer prefers those varieties of wheat which return heavy yields per acre, irrespective of quality of the grain; and so long as no premium is put on quality, he cannot be blamed for this attitude. Thus, the tendency is to neglect wheats which are high in quality as, in most cases, these are not the most prolific.

The miller, on the other hand, prefers those varieties which will mill readily and yield a large percentage of high grade flour. In this he is supported by the baker, who demands a flour of good colour, yielding a large number of well-piled loaves of good volume per sack of flour. It is evident, therefore, that the farmer and the miller are working with two different ends in view—the former considering only yield while the latter's main consideration is quality.

The wheat-breeder aims at reconciling both these points of view by endeavouring to breed new varieties, which will combine high yield with excellent quality, and thus satisfy both parties. Although,

generally speaking, high-quality wheats are not the most prolific, it is not impossible to combine these two characteristics in the same strain, and the breeder is continually working to this end. The ideal wheat, therefore, is one which will be disease-resistant, will give a high yield per acre, and, on milling, a high percentage of flour of good colour, high gluten content, and good baking quality.

Quality is an inherent characteristic of the variety, e.g., a Minister wheat will always give a better quality flour than, say, Federation of the same protein content, but quality is also dependent on the climatic and soil conditions under which the wheat is grown. Striking evidence of this will be submitted in a later report on wheats from various parts of the State. But, apparently, there is no reason why high-strength wheats cannot be grown in most of the wheat belt in Victoria.

Experimental field plots enable the wheat-breeder to determine the relative yields of various strains. His work on wheat improvement, however, is not complete unless his varieties can be tested for quality, and it is here that the experimental flour-mill and baking-oven come to his assistance in completely evaluating different varieties. The experimental flour-mill, working with as little as 1 lb. of wheat, measures accurately flour yield, and the baking test, whereby a standard loaf is baked under standard conditions, is as yet the only sure test of strength or quality, and differentiates between various wheats in this respect. The breeder is thus, early in his experiments, enabled to judge the relative values of different strains and to discard the least promising, thus saving a considerable amount of unnecessary work in propagating strains lacking in flour yield or baking quality.

A number of crossbred wheats were tested from the State Research Farm, Werribee, this year, but before proceeding with the results obtained it might be desirable to describe very briefly the construction of the wheat berry, and the principles involved in experimental flour milling.

The Wheat Berry.

A grain of wheat is composed of three distinct parts, each of which has its own particular bearing on mill practice:—

1. Outer skin or covering.
2. Germ.
3. Endosperm.

The outer skin consists of more or less well-defined layers, at least five in number, which serve as a protection for the grain and endosperm. In the process of milling, these are removed from the remainder of the kernel and form the bran. The germ is rich in protein fat and oil, and is removed during the process of milling. Owing to its high fat and protein content it would tend to develop rancidity, and impair the colour if left in the flour. With the very fine chippings from the bran, and particles of the middlings which resist reduction, the flattened

germ forms the pollard. The endosperm, consisting of 75-80 per cent. of the kernel is composed principally of starch cells, and, on reduction, yields the flour.

Experimental Milling.

Before milling, conditioning is necessary. This consists of adding sufficient water to the wheat to raise its moisture content to the percentage desired for the milling operations. The moisture content desirable for experimental milling is 14.5 per cent. for soft wheats, and 15 per cent. for hard wheats. The addition of water to the wheat toughens the skin of the berry and makes it capable of being separated more readily from the endosperm.

The operation of an experimental mill necessarily differs in some respects from that of a commercial mill. In the experimental mill there is no continuous or automatic flow of stock from one machine to another, and transference must be done by hand. The mill is an electrically-driven experimental roller flour-mill, made by Henry Simon. It consists of two roller mills, one for the breaks with two sets of corrugated rolls, and one with smooth rolls used for the reductions. The mill has two plansifters, each fitted with four sieves, the rolls and plansifters being so constructed that as each sample is milled, they can be taken to pieces, thoroughly cleaned, and all the products recovered. Each plansifter consists of four airtight sieves placed on top of one another, and run at 120 revolutions per minute, with a rotary motion. The grind passes from the rolls to the first sieve and thence automatically over the other sieves until the grind has been graded, and each grade sent to its proper destination. The sieves used are of different degrees of fineness, from No. 2 wire to No. 11 silk. A set of hand sieves is also used as accessories for extracting the offal. The milling operations consist of four breaks, one with the coarse rolls and three with the finer rolls, to remove the bran. The endosperm is broken up into semolina in the break rolls, and is subjected to nine reductions in the smooth rolls. The germ becomes flattened and is removed with the fine bran chips as pollard, the fine semolina being gradually reduced to flour. The products—bran, pollard, and flour—are weighed, the percentage being calculated on the weight recovered. This description is very brief, as the experimental mill was described in this *Journal* for October, 1913.

Crossbred Wheats.

The following crossbred wheats from the State Research Farm, Werribee, were received for milling and baking tests:—

1. Free Gallipoli
2. Ranee
3. Ranee 4H
4. Indian F x Fed. L4119-2-11-2
5. Rajah Seln. 2281
6. Mogul
7. Nizam
8. Sepoy 324 J.
9. Ghurka
10. Cu. x Major x Gall.
11. Golden Grain x Bobs
12. Wannon

These samples were tested, with the following results:—

Table I.—Results of Tests on Wheats Received.

No.	Bushel Weight.	Moisture.	Ash.	Protein (N x 5·7).
		%	%	%
1	65·9	11·4	1·27	9·14
2	65·1	12·2	1·08	10·23
3	65·7	12·3	1·56	9·92
4	63·8	12·2	1·12	10·69
5	62·1	12·3	1·03	9·95
6	65·2	12·2	1·11	10·19
7	66·0	11·5	1·08	9·35
8	64·2	12·0	1·14	9·10
9	65·4	11·9	1·31	9·74
10	65·5	11·5	1·21	9·12
11	65·1	11·7	1·25	11·30
12	64·9	11·3	1·65	13·71

The protein content is not high, except in No. 12.

A 1,500-gram sample was conditioned and milled, with the results given in the following table:—

Table II.—Milling Results.

No.	Bran.	Pollard.	Flour.	Flour Colour.	Remarks on Milling.
	%	%	%		
1	16·77	8·20	75·03	Good ..	Bran very clean and good
2	17·02	9·62	73·36	Fairly cream	Bran not clean, and chipped. Hard to reduce
3	19·51	8·01	72·48	Fair ..	Bran not clean, and chipped. Hard to reduce
4	20·48	8·25	71·27	Good ..	Easy to mill
5	20·34	7·72	71·94	Good ..	Soft, easy to reduce. Bran broad, but not clean
6	23·1	7·08	69·82	Fair ..	Bran large, but floury. Very soft wheat
7	19·33	8·41	72·26	Good ..	Easy to reduce. Bran good
8	19·97	6·66	73·37	Good ..	Fairly soft, easy to reduce
9	18·18	7·18	74·64	Good ..	Bran very clean, easy to mill
10	18·48	6·21	75·31	Fairly cream	Bran good, easy to mill
11	22·24	8·01	69·75	Fair ..	Small wheat, harder to mill. Bran small, but very clean
12	19·50	7·94	72·56	Good ..	Bran fairly small, but very clean

The results are self-explanatory. Flour yields of 70 to 72 per cent. can be considered as satisfactory, and it will be observed that Nos. 1

and 10 are rather outstanding as far as yield is concerned. Flours, after ageing one week, were tested with the following results:—

Table III.—Results of Tests on Flours Milled from the Twelve Wheats.

No.	Ash.	Protein.	Water Absorption.	Wet Gluten.	Dry Gluten.
	%	%	Quarts.	%	%
1	·40	8·70	43	22·80	7·64
2	·54	9·38	48	24·08	8·75
3	·49	9·22	49	23·45	8·61
4	·66	9·98	46	24·99	9·10
5	·48	9·10	44	22·16	7·65
6	·61	9·30	42	24·40	8·24
7	·41	8·38	42	21·45	7·88
8	·48	7·90	42	19·90	6·72
9	·56	8·50	40	24·02	8·32
10	·57	8·30	42	20·95	7·41
11	·34	10·46	45	28·58	9·77
12	·49	12·77	44	33·92	12·40

Wheats with a high or low protein yield, on milling, flour with a correspondingly high or low protein content. Although baking strength is somewhat correlated with protein content, the latter is not always indicative of baking strength. There is usually a marked correlation between protein and gluten content, but the quality of the gluten is of as much importance as the quantity, the ability to make a large loaf depending primarily upon an adequate quantity of high-quality gluten in the flour.

Some authorities claim that to be satisfactory from a baking standpoint, flour should not contain less than about 10.5 per cent. protein. Judged from this point of view, most of these flours cannot be considered of high quality.

The ash content of straight-run flour varies with the wheat and the care exercised in milling, but usually ranges from .4 per cent. to .5 per cent.

The water absorption figure expresses the number of quarts of water required for a 200-lb. sack of flour to make a dough of required consistency suitable for bread-making. This is important commercially, as, other things being equal, the more water that can be added to a given weight of flour, the greater the weight of bread it will produce.

Experimental Baking.

"Strength" of flour is usually defined as its capacity for producing large, well-piled loaves, and, up to the present, the baking test is the only satisfactory method of measuring strength. Thus, the object of experimental baking is to determine the relative differences in the strength of various samples of flour, and to do this accurately, the baking test must be standardized as much as possible. The only variables are the amount of water added to make the dough, and the time

occupied in final pan-proving, these factors depending on inherent physical and chemical properties of the flour.

It is not considered necessary to describe the baking test in detail, but it should be pointed out that the test loaf differs to some extent from the ordinary commercial loaf. In test-baking the dough is pan-proved considerably longer than in commercial baking, the idea being to obtain the largest loaf volume possible without breaking the crumb wall. In commercial baking the dough is usually placed in the oven some time before it has expanded to its maximum volume, in order that a finer textured bread may be produced.

It is claimed that with the test loaf, formed when the dough is allowed to ferment to the point when the loaf of largest size is produced, loaf volume may be considered an expression of the relative strength of the flour. Crumb texture should also be considered, and the coarse texture in the test loaf offers a wider scope for comparison of crumb than is the case with finer textured loaves.

The weight of the loaf when baked under uniform conditions is of value in calculating the number of loaves which can be produced from a given quantity of flour.

With each batch of test loaves, a check loaf is baked from a flour of known quality, so that any unusual conditions, such as variation in yeast, may be exposed.

Baking results from the flours under consideration are given in the following table:—

Table IV.—Baking Results.

No.	Loaf Volume.	Weight.	Remarks.
	c.c.s.	Grams.	
1	1,350	492	Small loaf with good crust
2	1,720	502	Good loaf
3	1,620	501	Good loaf
4	1,560	488	Good loaf with fine texture
5	1,480	495	Small but good loaf
6	1,600	485·5	Good loaf
7	1,530	495·5	Fair loaf
8	1,460	486·5	Loaf fair
9	1,440	490·5	Small loaf with weak crust
10	1,400	487·5	Small loaf with fine texture
11	1,640	515	Good loaf
12	1,660	494	Good loaf

It will be observed that loaf volume is not directly correlated with protein content. The flour with the highest loaf volume has only the fourth highest protein. Nos. 12 and 11 come next in loaf volume, and these two in this order have the highest protein content. The order of merit of the remainder can be seen from the table above.

Owing, probably, to the climatic and other conditions under which the wheats were grown, practically all of these flours are inferior in strength, as indicated by loaf volume. The results, of course, confirm the opinion formed from analyses of the wheats and their respective flours.

CONTAGIOUS ABORTION OF CATTLE.

(ABORTION DISEASE OF CATTLE. INFECTIOUS ABORTION.)

(By R. J. de Courcy Talbot, B.V.Sc., Veterinary Officer.)

Contagious Abortion, as it is commonly known in this country, is a contagious or infectious disease principally affecting cattle, and is characterized by a severe inflammation of the uterus ("breeding bag") which results in the expulsion of the foetus at any time during pregnancy.

The disease has been known to cattle breeders for many hundreds of years, and at the present time it is prevalent in practically every country. It is a constant menace to the pure-bred live-stock industry, as well as to the economical production of meat and milk, because its presence in a herd means not only loss of the aborted calves, but also a diminished milk yield from the cows affected, as animals which give birth to a calf prematurely seldom, if ever, reach their full milking capacity for the year. Another serious loss from the dairyman's and pure-stock-breeder's point of view is the fact that, following abortion, many cows become sterile.

To a breeder of pure stock the occurrence of this disease entails considerable loss: it means, in fact, that he must temporarily go out of the business, for besides losing his crop of calves, the fact that his herd is affected soon becomes known, and no one is anxious to purchase any stock from him.

Even in the earliest times Contagious Abortion was recognized as being of an infectious or contagious nature, although it was not until 1896 that Professor Bang, a Danish Veterinary Surgeon, discovered the causal organism, which is now called the *bacillus abortus,* or Bang bacillus, and in every case of the disease it is possible to demonstrate the presence of this germ in the aborted foetus, the membranes, and the discharge from the uterus. Abortion sometimes occurs as a result of an accident to a cow heavy in calf, and also as a sequel to other diseases, but the safest policy for the stock owner to adopt is to treat every case as being contagious until definite proof one way or the other is forthcoming.

Methods of Infection.

It used to be thought at one time that the only way a cow could contract the disease was by the bull carrying the infection from one animal to another at the time of service. However, as a result of considerable experimental work, it is now recognized that although infection may possibly take place in this manner, by far the greater number of cows become infected through the ingestion of food contaminated by the discharge of cows which have aborted. These discharges, as already stated, contain large numbers of the germs which cause the disease, and after reaching the intestines they are carried by the blood to the uterus of the pregnant animal, where they set up the inflammatory condition which ultimately causes the expulsion of the foetus.

In the case of a mature cow, which is not pregnant but which is lactating, germs taken in with food may, even after the lapse of some time, be present in the udder and not in the uterus, but when the animal becomes pregnant they proceed from the udder to the uterus and cause abortion.

After an abortion the organisms are present in the uterus and all discharges are infectious. In about two months, however, providing the animal has not in the meantime become pregnant, the germs leave this organ, and are then found in large numbers in the udder, and may be detected in the milk.

Young calves fed on milk from such cows do not become infected, but pregnant heifers, or cows which have had a calf, fed on such milk will develop the disease.

In cows which have aborted and subsequently become pregnant, the organisms migrate from the udder to the uterus and may cause a second abortion, but this is not common, as the first abortion confers a certain tolerance to the germ and such animals usually carry the calf the full time, and have an apparently normal parturition (calving), but the foetus, membranes, and discharge from such animals will be infected with the germs of the disease. It is rare for animals to abort three times, although it does sometimes happen.

The Contagious Abortion germs will remain alive in the dead foetus or membranes for many months, hence the necessity of destroying these immediately by either burning or burying. When present in dry manure or urine they die in one or two days.

It has been demonstrated by experiment that if the Contagious Abortion germs are injected under the skin, placed in the vagina of pregnant cows, or fed to them, then abortion will take place in from six to ten weeks.

Symptoms.

A cow affected with this disease displays practically no symptoms until the act of abortion takes place. This is particularly so with those which abort about the fifth month of pregnancy or earlier. There may be a slight swelling of the external genitals, the animal may appear restless, and the udder may be slightly enlarged.

The foetus when expelled is usually dead, and in the majority of cases the membranes are retained, and there is a discharge from the uterus of a dirty-brown-coloured fluid which is often evil smelling. This discharge persists for about a fortnight or three weeks after the membranes have been expelled or removed.

When an animal aborts in a herd in which the contagious germ of the disease is not known to exist it is essential that, as soon as possible, the stock owner should know definitely whether the abortion was contagious or not, so that he may take all precautions to prevent the spread of the disease through the remaining animals of the herd. Fortunately, such a definite diagnosis is possible by subjecting a sample of the animal's blood to a test known as the agglutination test. This test is a very valuable one, as by its means we are able to detect which animals are affected with the disease some considerable time before the actual abortion takes place, and at any time subsequent to this.

As will be seen later, any plan for the eradication and control of Contagious Abortion must depend very largely upon the use of this test for detecting affected animals in a herd. To take samples of blood from a cow for the purpose of testing, incise one of the small veins at the back of the ear or make a small cut at the tip of the tail. (Before the incision is made in either place, the hair should be clipped off and the skin thoroughly cleansed.) About an ounce of blood should be allowed to drip into a small bottle which, together with the cork to be used, should have been sterilized by being boiled; the bottle should be perfectly dry at the time the sample is taken. After the blood has clotted, which it will do in a short time, the bottle should be gently shaken to remove the clot from the sides. The sample should then be labelled with name or number of cow, date, &c., and should be forwarded without delay and by the quickest route to the Chief Veterinary Inspector, Department of Agriculture, Melbourne.

Since the earliest times many different forms of treatment have been advocated. Some of them have for a short time been thought to be successful, but we know at the present time that all of them have failed either to cure or prevent the spread of the disease. Great hopes were entertained for vaccines, but these, too, have proved absolutely unsuccessful, and their use is a waste of time and money. The use of live vaccine is prohibited in Victoria without the special permission of the Chief Veterinary Inspector.

Prevention and Control.

As no cure for the disease is at present known, then the most we can hope for is to prevent its spread by proper methods of control.

After an animal has aborted, she should be immediately isolated from all other stock, and the foetus and membranes should be either burnt or buried deeply, if possible where they were dropped. The tail, legs, outside of vagina and udder of the animal must be thoroughly washed with warm soda and water and then with some suitable antiseptic solution. The vagina and uterus should be irrigated with a warm antiseptic solution such as lysol, one teaspoonful to the pint (on no account should the solution be stronger than this). This irrigation should be repeated twice daily until the discharge ceases, which is usually in about a fortnight or three weeks. If the membranes are retained for longer than 48 hours, steps must be taken to remove them. The arm, after being well cleansed and smeared with vaseline, is inserted into the vagina, and thence through the neck into the uterus. The membranes should be then carefully separated from the "tufts" without using undue force; if this is not possible, a quantity of warm weak antiseptic solution should be introduced, and a further effort should be made to remove the membranes next day. This treatment should be continued until all the membrane has been expelled. A cow which has aborted should never on any account be mated with the bull until at least two months after the discharge has ceased.

Sterility is a frequent result of contagious abortion. It may be caused by the inflammatory condition of the uterus, associated with

the disease becoming chronic and spreading to other organs, such as the ovaries, or by an infection of the uterus due to the retention of the membranes. It is also sometimes the result of washing out the uterus with very strong antiseptic solution.

Bulls which have served affected cows should have the sheath well irrigated with an antiseptic solution, such as 1 per cent. lysol or 2 per cent. zinc sulphate solution. The hair around the opening of the sheath should be clipped short.

The introduction of contagious abortion into a herd is usually traceable to the addition of a pregnant cow which has become infected on some other property, or to a cow which has just recently aborted. In either case it will not be long before many other members of the herd are affected. It sometimes happens that clean cows come in contact with infected animals at agricultural shows, or at sale-yards, and so contract the disease. The remains of aborted "slinks" and afterbirth may be carried on to a clean farm by birds and dogs, and be responsible for the introduction of the disease.

Bulls may spread the disease from one herd to another, but possibly this source of infection is responsible to a very much smaller degree than the other causes we have mentioned. Undoubtedly the chief means of spreading the disease is by the contamination of pastures with the discharges from recently aborted animals.

In the control of this disease, early and certain diagnosis is essential. For although it can usually be diagnosed after the actual abortion has taken place, much time is wasted, because it is possible that many other members of the herd may have become infected in the meantime. This could have been prevented had it been known that one cow in the herd was affected. Fortunately it is possible to diagnose the disease long before the actual abortion takes place by means of the agglutination test (see pages 72-3).

Many schemes have been evolved for the control of the disease, but the greatest success has attended those which have depended upon the practice of rigid methods of sanitation and disinfection, and where, at the same time, the blood test is used to determine the presence of infection in individual members of the herd. Possibly the most successful plan for the eradication of the disease has been that adopted by the Department of Agriculture of Pennsylania, U.S.A. This plan has been in operation since 1920, and it is now possible to express an opinion as to its value.

If the disease is to be successfully controlled in Victoria, some plan of a similar nature must be adopted here.

In an article by M. F. Barnes in the *Journal of the American Veterinary Medical Association* for January, 1926, it is stated that the plan was evolved for the eradication and control of contagious abortion because it was thought that such a scheme would benefit the cattle industry in the following ways:—

1. Improve the quality of the herd, and lead to increased production and decreased costs.
2. Establish a definite means of prevention and control for those who desired it.
3. Encourage stockmen to establish abortion-free and more highly efficient herds.

4. Provide a safe place from which prospective purchasers could obtain new animals.
5. Educate dairymen and breeders to the necessity of veterinary supervision.
6. Make all producers of live-stock and milk maintain a higher degree of sanitation.
7. Create more public interest in dairy products.

Briefly, the plan is as follows:—

An agreement is entered into by the owner with the Department of Agriculture in which the owner agrees to observe and comply with the requirements of the plan. He gives a list of all his cattle, and states that he is prepared to employ a competent veterinary surgeon at his own expense to do all the testing as ordered by the Department.

An agglutination test is then made of all his cows, and reactors are either eliminated at once or kept segregated until such time as they have ceased to be profitable in regard to milk production (in the lactation period immediately following the test), when they must be disposed of in a manner approved by the Department (this usually means being slaughtered for beef).

Retests are made in from 30 to 60 days and continued until no reactors have been found for a period of one year. The herd is then tested at periods of not less than one year. After a period of a year has elapsed without a reactor, an abortion-free certificate is issued to the owner for a period of one year, subject to annual testing.

Disinfectant measures in regard to aborting cows, disposal of foetus and membranes, and general sanitation of premises and yards must be adopted by the owners under the supervision of the Department. Mr. Barnes, in the article referred to above, states that the important essentials making for the success of the plan are as follows:—

1. Improvement in blood lines should be made as much as possible by careful selection within the herd rather than from outside sources, thus excluding possibility of outside infection.
2. There should be provided a separate stable known as a maternity barn for cows at calving time. This stable should be so constructed that it can be easily and thoroughly disinfected, or, better still, fumigated with formaldehyde. On farms containing a large number of cows it should have a sufficient number of completely separate stalls to accommodate the number of cows that would be calving at the time.
3. Every cow should be removed from the herd and placed in the maternity stable at calving time. Cows showing symptoms of abortion should be placed either in the maternity stable or in a hospital stable maintained especially for the purpose of isolation of animals showing evidence of the disease. All cows placed in the maternity stable should be kept there until all discharges following calving have ceased.
4. All afterbirths and aborted or dead calves should be carried in a non-leakable container to a suitable place and well buried or burnt immediately.

5. The maternity stall should be well cleaned and effectively disinfected.
6. The stockman should observe all pregnant animals daily, and should remove suspicious animals from the herd before any considerable damage has been done.
7. If an abortion occurs in a stable the cow should be immediately isolated, the foetus and membranes carried in a proper container to a suitable place and burnt, and the stable should be well cleaned and disinfected. An abortion occurring in a field should be handled in the same way. The earth at the point where the abortion occurred should be covered with lime and a strong disinfectant.
8. Every case of abortion should be considered infectious until otherwise determined.
9. Feed should be obtained from sources most likely to be free from disease-producing organisms, and should be so stored that it will be insured against contamination.
10. No cow should have access to manure heaps.
11. Herd bulls should not be used for service to neighbours' cows.
12. If purchases are to be made, the history of the herd from which one wishes to purchase, and the individual animal's history, should be obtained, and, if either is doubtful, the purchase should not be made until the animal's health is definitely determined.
13. Pregnant animals should not be purchased unless isolated until they have given birth to a calf, and have passed a satisfactory blood test, not within two weeks after having calved, and until the discharges following calving have ceased.
14. No person should be permitted to inject a vaccine or serum to prevent abortion unless it has the stamp of approval of the official charged with the prevention, control, and repression of transmissible animal diseases in the State. Abortion vaccine and bacterins will cause animals to react, and should not be used in herds where testing is being done.
15. No animals susceptible to the disease should have access to neighbours' animals, and should be protected in such a way that there is no communication whatever.
16. The blood test should be applied at frequent intervals, and all reactors, both male and female, immediately removed until all remaining animals have passed several consecutive tests.
17. Every reactor should be considered a carrier, and every carrier a spreader.
18. Every cow in the herd should be considered a spreader at calving time until no reactors have been found over a period of one year.
19. It is much easier to keep herds free from contagious abortion than to establish free herds from those which have once become infected.

These are the main essentials of the Pennsylvania plan, which may be applied to conditions in Victoria. Their adoption here would present very great difficulties, and some of the conditions could not possibly be put into operation. There is no reason, however, why some modification of the plan should not be adopted, particularly among the

breeders of pure stock, as well as those progressive members of Herd-Testing Associations throughout the State, who are building up such splendid grade herds, and to whom the disease is such a real danger. There are many herds free from disease at the present time, and the aim of the breeder should be to keep them so.

To be absolutely sure that the herd is free of the disease, all the cattle on the property should be tested by the agglutination test. If the herd is then found to be free, a retest should be made in two months' time, and, if there are no reactors this time, then the herd may be considered free of contagious abortion, and every endeavour to keep it free from any possible source of infection should be made. No cows or bull should be introduced into the herd or admitted on to the farm unless they have passed the blood test, and no stock should be exposed to contact with any vehicle or building which have been used by other cattle.

With an infected heard, the only procedure to be adopted to free the herd of the disease is the application of some plan similar to that adopted in America.

Farmers desiring further information on the control and eradication of this disease should write to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, and, wherever possible, a veterinary officer will be sent to discuss their problems with them.

MILK FEVER.

(CALVING FEVER.)

By R. J. de Courcy Talbot, B.V.Sc., Veterinary Officer.

Milk fever is a disease which affects cows usually after calving, and is characterized by a sudden loss of consciousness, and a general paralytic condition.

Most dairy-farmers, particularly those breeding high producing stock, are familiar with the disease, but in the minds of many there appears to be doubt, if not ignorance, as to the correct treatment, and consequently the death rate on some farms is high.

The disease has been known for a great many years, and until a successful treatment was discovered it was responsible for very heavy losses. It was first described by German veterinarians about the beginning of the nineteenth century, a time that coincided with the period when it became customary to feed milking cows with the object of increasing their milk flow. This heavy feeding undoubtedly has some influence on the incidence of the disease.

Cause.

The actual cause is unknown, and although many theories have been advanced, none of them offers any entirely satisfactory explanation of the many phases of the disease.

It is known, as a result of observations extending over many years, that there are certain conditions which definitely predispose an animal to an attack. High-producing animals, and those which are putting on condition rapidly at the time of calving, are prone to become afflicted. Age is an important factor, most attacks occurring after the third or subsequent calving, and, strangely enough, more cases of the disease are recorded after an easy calving than one in which the birth of the calf was attended with some difficulty.

A cow, once affected, is always likely to suffer a further attack at some subsequent calving. The disease usually occurs in the first three days after calving, although very occasionally cases have been recorded as occurring prior to parturition.

Symptoms.

The cow appears to be quite normal for from one to two days after an easy calving, then the appetite commences to fail; she appears to be restless, and the gait becomes staggering. In some cases excitement is exhibited, and the beast may run about and bellow furiously; soon, however, a weakness of the hind legs is observed, and the animal then lies down and makes no attempt to rise. In a short time she appears as if in a deep sleep and is semi-conscious; she lies on one side with the feet drawn under the body and the head turned sideways, and resting on the shoulder of the upper side. This peculiar attitude is typical of most cases. The beast is quite oblivious of anything happening around her, and makes no response when shouted at or struck a blow. The mouth may be half open, with saliva dripping from it, due to the fact that the animal is unable to swallow owing to the muscles of the throat being paralyzed; for this reason it is inadvisable to give a drench, for, if this is attempted, it usually results in the fluid passing into the lungs and causing pneumonia, frequently with fatal results. In no circumstances should the animal be drenched while lying down.

The temperature of a cow suffering from this disease is usually subnormal, somewhere about 98° or 99°. (The normal temperature of a cow is from 100.5° to 101.5°.) The name "Milk Fever," therefore, is rather misleading, because a fever of any sort is usually associated with a high temperature. At this stage, the pupils are dilated, and the breathing is slow and deep. If correct treatment is not adopted at once, death results in the majority of cases in from one to three days, and usually, it occurs almost unnoticed, the breathing gradually becoming slower until finally it ceases altogether. In some cases violent convulsions precede death.

Treatment.

Until about twenty years ago, no satisfactory treatment of the disease was known, and the death rate in consequence was extremely high; in fact recovery seldom, if ever, took place once an animal went down. In the year 1897 Schmidt, a Danish veterinarian, suggested a method of treatment which proved to be a great advance on any then in use, and it was as a result of his research into the disease that the modern treatment, which has proved so successful, has been evolved.

It is essential that treatment be commenced as soon as possible, and wherever practicable the services of a qualified veterinary surgeon should be obtained. If, however, professional assistance is not available, proceed as follows:—

First of all the cow should be well bedded down where she is lying with straw or grass hay, and made as dry and warm as circumstances will permit. She should be propped up on her chest with bales of straw or bags of chaff, and turned from one side to the other every two or three hours.

The essential part of the treatment consists in the inflation of the udder with filtered air, and this should be carried out in this way:—

First remove the milk from the quarters, and then thoroughly wash the udder with soap and a warm solution of some suitable disinfectant such as lysol (one teaspoonful to a pint of water). A piece of clean cloth which has been damped with the disinfectant solution should be placed under the udder to prevent the teats from coming in contact with the ground, dirty straw, &c. Each quarter should now be inflated with air, a milk fever outfit being used for the purpose. This outfit consists of a small air pump, from which air is filtered through a cylinder containing cotton-wool, and then into the quarter by means of a teat syphon, which must be sterilized by being boiled for at least ten minutes; it should be placed in water which has been boiled before it is inserted into the teat duct. Prior to its being used on the second quarter it should be placed in a dish of antiseptic solution for a little time, and then washed in boiling water just prior to being introduced into the teat. This operation should be repeated before it is inserted in the third quarter, and also before it is placed in the fourth teat. The cotton-wool in the cylinder should be renewed before the outfit is used. Failure to observe these precautions may result in an attack of mastitis and the consequent loss of one or more quarters.

Sufficient air should be introduced to visibly distend the quarters, and, following the inflation, the udders should be gently massaged to distribute the air throughout the milk ducts. It is unnecessary to tie the teats to prevent the air from escaping. The treatment suggested usually results in a cure in a comparatively short time. If, however, the cow does not rise in six hours, the treatment should be repeated at intervals until the animal gets on her feet.

After recovery the cow should not be milked for at least twelve hours, and she should not be milked completely dry for at least two or three days. A light diet of green feed only should be allowed for a week after the attack.

The incidence of the disease may be appreciably reduced by avoiding high feeding prior to calving, and by not milking the cow out dry for two or three days.

In the case of a cow which has previously suffered from an attack, a purgative drench consisting of twelve packets of Epsom salts, two tablespoonfuls of ground ginger, and 2 lb. of treacle, in 1 quart of water, should be administered about a week or ten days prior to the date she is due to calve.

The following points in regard to treatment are important:—

1. Obtain professional advice wherever possible.
2. Make the animal as comfortable as the circumstances permit.
3. Pay strict attention to the cleaning and disinfection of the udder prior to inflation.
4. Thoroughly sterilize the teat syphon; keep it in boiled water; do not allow it to come in contact with anything before it is inserted into the teat.
5. Don't drench the animal while she is down.

A SOUTH GIPPSLAND FARM.

SUCCESS ON A SMALL AREA.

By W. J. Yuill, Senior Dairy Supervisor.

The dairy farm of Mr. Luke Jones at Dollar, in the steepest of the South Gippsland hill country, is of great interest for several reasons. Dollar is approximately 20 miles from the sea, and its altitude is 2,000 feet. Many men on adjoining farms have failed, and I doubt if there is any dairy farm in the State similarly situated that can claim such splendid results as are now being obtained by Mr. Jones from his 130-acre block, a considerable area of which is too steep for cultivation. It, however, has the advantage of an annual average rainfall of more than 40 inches fairly evenly distributed through the year.

For the year ended 30th June, 1928, the gross receipts from the farm totalled £1,253 19s. The net amount from cows and pigs (after deducting the cost of pollard) was £1,002 10s. The gross average return per acre was £9 14s. The excellence of this figure can be gauged from the fact that some New Zealand authorities regard £7 per acre as a very good return.

The Herd Testing Association figures for the year 1928 show that the average yield of butter fat of Mr. Jones's herd (without any allowance for heifers) was 281 lb. The figures printed on page 85 disclose that, for the six months period 1st July to 31st December last, the amount received for cream was *£221 1s. more* than that received during the twelve months of 1921, while the profit from the sale of pigs during the same period of 1928 was only *£9 less than the full amount* for 1921.

Many may be inclined to attribute such success to some vague set of circumstances, usually spoken of as luck, but the main factors that made for success were grit, industry, and managerial ability. There were certainly no special circumstances that favoured Mr. Jones. His success was entirely due to a keen business sense, which led him to adopt any improvement calculated to improve his farm methods.

This is the reason why his farm has been wire-netted. Further, it is the reason why he practises pasture top-dressing; why he uses a production-bred pure bull; and is a keen advocate of herd testing and culling his dairy herd on definite knowledge of each cow's producing

ability; and again why he cools the cream from the separator, and stores it in a cool dairy, well removed from the tainted environment of the cow-shed and yard.

The receipts from pigs amounted to £4 4s. for each cow milked. This represents the value of the skim milk, less the cost of labour, which is charged against the whole of the farm operations. Such returns were not obtained from the short, thick-shouldered type of pig. Mr. Jones favours the Tamworth hog on British Black-Yorkshire sows. These sows have proved splendid mothers, averaging from ten to twelve pigs each litter. Two Large White sows were recently obtained, one of which farrowed ten pigs on her first litter.

The whole of the work on the farm is carried on by the family, except the hay-cutting and carting—a small item, which costs no more than £8 a year.

One of the charges brought against farmers is their neglect to pay anything like reasonable wages to the members of their families who carry on the farm work. Far too often that charge has ample foundation. But it is not so in the case of Mr. Jones. Each of his two sons, who are little more than lads, are allowed a wage of £2 per week, and a daughter £1 per week, in addition to their keep. And if to some it seems that in the circumstances the rate of wage might be more generous, it may be mentioned that Mr. Jones has recently purchased an additional farm, in which the sons have been given a financial interest.

Pasture Top-dressing.

I remember the misgivings with which Mr. Jones attempted his first top-dressing experiment about eight years ago.

It was then thought that the response from the pasture would not be equal to the cost of the manure and the cost of application, for it must be remembered that a considerable area of the farm is very steep, and the manure had to be broadcast by hand.

The first bag of superphosphate was used on a comparatively poor section of the farm, and the result just about justified the opinion held. Though some improvement was noticeable in the pasture, particularly in the increased clover and trefoil, the verdict was that the result hardly squared with the cost.

During the following summer, however, this area remained green longer than the remaining portion of the farm. Mr. Jones was quick to see that if top-dressing would keep the pasture green for a longer period, in addition to giving some increase in quantity and quality, this would mean a longer period of "peak" production from the dairy herd —more "middle" in the season, and less "ends."

The main road to Stony Creek separates a paddock of 40 acres from the main area of the farm. This paddock is mainly blackbutt country, while the home paddocks are blue-gum ridges. In the autumn following the trial, the whole of this 40 acres received 1 cwt. of superphosphate per acre. The result was not by any means sensational, but there was some increase in the legumes, while there was a stronger seeding of cocksfoot grass. In the following autumn, this paddock was given a further cwt. of superphosphate per acre, with the result that in the place of a thin stand of poorly seeded cocksfoot, amongst dandelion and other weeds, there is now a pasture equal to that of the rest of the farm.

Previously the milking herd was depastured on this area for a few weeks in the spring, and great difficulty was experienced in forcing them across the road into the paddock. Now they will enter it as readily as they will go to any other portion of the farm.

Following on top-dressing, clovers, particularly subterranean clover, have greatly increased in the pastures, the carrying capacity of which is now one-fourth greater than it was eight years ago.

Half the farm is top-dressed annually at a cost of £30. With more legumes in the pasture, and culling out of unprofitable cows, there has been a steady increase in the milk yield of the herd cows.

Red clover hay is now being used in place of some of the oat crop. Oaten hay has been the main winter feed for many years, for there is little growth in South Gippsland pasture during the winter months.

Since the advent of top-dressing, the whole plan of the dairying operations has been moved forward two months. The cows are now calved in June-July, when there is ample grazing available. It is customary to have all the stock off the farm for a few weeks in the autumn. This allows the pasture to get a start, as well as an opportunity to sweeten.

Grazing the oat crop in winter is not now required, and all efforts are used to make available more green feed in the summer. For this purpose red clover is good forage when there is a normal rainfall.

In November of last year, approximately 2 tons of clover hay per acre was harvested. In less than a month, after 68 points of rain, the plants had grown from 9 to 12 inches. By grazing the dairy herd on the clover for an hour or two daily, as the pasture is going off, the milk flow is maintained for a longer period. An annual dressing of 1 cwt. of superphosphate is given. It is not uncommon to hear subterranean clover described as a weed, and fears are often expressed that it may overrun pastures. It is certainly very aggressive, and will spread rapidly. Its characteristic habit of turning down and partially burying the seed heads, ensures a good germination. That other grasses still flourish on the farm is evident from the fact that this season Mr. Jones expects to strip 15 bags of cocksfoot seed, worth £1 per bag. This is likewise evidence that the farm is far from being overstocked.

During the seasons 1921 and 1922, 30 cows were milked, while for the years 1926 and 1927 the average number was 40. A comparison of the results of these two-year periods is interesting:—

Two-year Periods.	Average No. of Cows.	Average lbs. of Butter-fat.	Total Butter-fat per Year.
			lbs.
1921 and 1922	30	219.5	6,585
1927 and 1928	41	260	10,860

It will be seen that the carrying capacity of the farm has increased 25 per cent.; further, that there is an increase of 40.5 lb. of butter-fat per cow, and a difference in the farm's aggregate amount of butter-fat output of 4,275 lb., or 65.2 per cent. increase. In money terms, if butter-fat be valued at 1s. 6d. per lb., this is equal to £320 a year; in other words, an increase in salary of £6 4s. a week.

If a comparison of the returns for the year 1921 is made with those for the year 1928, it will be found that there is a difference of £493 12s., or an increase of 134.7 per cent. in the milk returns.

A Good Investment.

For an expenditure of £30 a year in superphosphate, at least ten more cows are now milked—an increase of over £200 per annum—a return of nearly 570 per cent. for the outlay.

It is not uncommon to hear dairymen affirm that a very short dairying season is all that can be expected when subterranean clover is prominent in the pasture. The figures in the statement on page 85, disclosing as they do greatly increased returns from the farm, show how unjustified are these assertions. Mr. Jones has found that he can get as long a season from this form of pasture as from any other. One outstanding difference is that dairying operations can be started considerably earlier in the season than was hitherto possible.

Since Mr. Jones has joined the Dumbulk Herd Testing Association, 20 cows have been culled from the herd, while six others are deemed to be unsatisfactory.

The herd average during 1928 for 41 cows (including six three-year-olds) was 6,954 lb. of milk; average test, 4,27 per cent., and 282 lb. of butter-fat. Forty per cent. of the herd cows are under four years of age. The best cow produced 417.5 lb. of butter-fat. This is a splendid performance, when it is remembered that no concentrates are used, and further that the farm is in very steep country.

The herd consists mainly of Jersey Ayrshire grade cows. The bull now on the farm is from Mr. Trevor Harvey's famous Jerseyholm stud.

After deducting the cost of pollard, which is the only form of feed used with skim milk for pig-feeding, the value of the skim milk is shown to be £152 14s. This figure is really an under-statement, for no allowance has been made for the feed, mainly skim milk, of three brood sows and a boar.

Depreciation and Interest.

It may be objected that in the statement on page 85 there is no mention of depreciation, stock sales, and interest. It would be difficult to say what amount should be set down under this heading. As a matter of fact, the value of the farm has appreciated; so also has the dairy herd, picked heifers from proved cows taking the place of the culled cows.

It will be found in practice that the value of such cows will about equal the cost of growing the heifers to the milking stage. This has been Mr. Jones' experience.

There is very little machinery on an average dairy farm, apart from the dairy utensils, separator, plough, and vehicles, all of which, together with buildings and fencing, do show depreciation, and for this allowance has to be made.

The item "interest" has been omitted, but the subject calls for comment. No balance-sheet is complete unless this item appears. It matters not whether the farm be owned or leased, interest remains a definite item. Owners of poorly managed dairy farms may be able to carry on by making interest a last item. Often little or no interest on capital is made. Lessee dairy farmers, however, must make interest the first item—for rent represents interest to the lessor. The capital

value of a farm is not an easy matter to define, particularly in an area where sales are infrequent, for farm land often carries a fictitious value.

Surely there can be no sounder basis for assessing value than the earning capacity of the acre. If this information were generally available, there would be a very considerable writing down in value of many dairy farms in some of the favoured areas of this State.

It is true that the managerial ability of the owner or lessee may have a great deal to do with the production of any farm, and allowance must be made for this when the worth of a place is being estimated.

What is Meant by Carrying Capacity.

The number of dairy cows on a farm does not necessarily represent its true "carrying capacity." To maintain a dairy cow in full milking form for ten months of the year with a herd average of from 250 to 300 lb. of butter-fat is quite a different thing from carrying half-nourished animals for the major part of the year with a herd return of approximately 100 to 150 lb. of butter-fat per cow.

If we accept the general basis of £100 per cow in land value, Mr. Jones's land must be worth £30 to £35 an acre, for it is carrying 41 dairy cows, 2 bulls, and 3 horses—equal to one to less than 3 acres. No allowance is made for calves, which remain on the farm for a considerable period. The earnings of a farm should be a truer indication of its value than the number of cows it will maintain in store condition, for the annual return from these may be very low.

If the poultry returns are omitted, a purely dairying proposition can be shown.

As the vegetables were grown on the farm by the ordinary labour, this item must be included in the statement of accounts.

Three bacon pigs are slaughtered annually for home use.

From 5 to 6 lb. of home-made butter is used weekly; while 1 pint of cream, and about 2 quarts of milk are used daily; £25 a year would be a conservative amount to allow for these items.

After adding them to the income for the year, and deducting all costs (which allows a liberal value for labour and management), there remains a balance of £305 15s., which represents interest on the capital value of the farm and stock.

This amount capitalized at 6 per cent. equals £5,190. The average land value in the neighbourhood would be about £15 an acre.

It is but fair to add that the latter part of the 1928 dairying season was very good. The conditions during the early portion, however, were far from satisfactory.

There is every indication that the returns for the present year will exceed those of 1928.

On this farm all are workers. Mrs. Jones has a small flock of 100 laying hens of the utility Black Orpington breed. As a result of her industry in this direction, the family now enjoy the luxury of a six-cylinder Dodge car, which is maintained from the poultry returns.

Though the general nature of the country is broken and steep, Mr. Jones has demonstrated that dairying can be made as profitable there as in any part of the State.

The returns are a striking indication of what can be obtained from dairy farming when the fertility of the soil is maintained, and modern methods are adopted and rationally applied.

Detailed Statement of Income from the Farm of Mr. Luke Jones, at Dollar.

(Cash Returns Only.)

Year.	Cows.					Pigs.		Poultry.		Vegetables Sold.	Gross Returns.	
	No.	Average Butter fat per Cow.	Total Returns from Butter Factory.	Return per Cow.	Value of Skim Milk per Cow.	Value of Pigs Sold.	Cost of Pig Feed.	Sale of Surplus Poultry and Eggs.	Cost of Feed.		For Farm.	Per Acre.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1921–2	29	..	366 14 0	12 13 0	3 14 0	135 0 0	26 16 0	..	..	..	..	3 17 0
1924–5	38	..	509 0 0	13 8 0	2 8 0	131 0 0	39 15 0	..	..	..	634 0 0	4 18 0
1925–6	40	198	695 0 0	17 7 0	1 6 0	114 10 0	62 9 0	..	..	..	809 14 0	6 4 0
1926–7	41	238	670 11 0	16 7 0	3 4 0	205 0 0	85 0 0	98 5 0	37 12 0	30 0 0	1,008 16 0	7 14 0
1927–8	41	282	860 6 0	21 0 0	3 10 0	237 13 0	95 9 0	120 5 0	25 0 0	35 15 0	1,253 19 0	9 14 0
1928–9 (To 31st Dec.—6 months only)	40	..	587 15 0	14 14 0	..	118 0 0	18 0 0	..	..	..	..	..

Statement of Receipts and Expenditure for Year ending 30th June, 1928.

Receipts.				*Expenditure.*			
		£ s. d.				£ s. d.	
To Cream sold to Butter Factory		860 6 0		By Family Help—£5 weekly		260 0 0	
„ Sale of Fat Pigs		237 13 0		„ Own salary—£7 weekly		364 0 0	
„ Sale of Vegetables		35 15 0		„ Manure	£30 0 0		
„ Produce supplied for Household—				„ Seed	25 0 0		
Three Bacon Pigs at £3 10s. each ..	£10 10 0			„ Winter Grazing	30 0 0		
Butter, Milk, and Cream	25 0 0			„ Pig Feed	95 9 0		
		35 10 0		„ Harvesting	8 0 0		
						188 9 0	
				„ Depreciation, Taxes, and Sundry Expense ..		50 0 0	
						862 9 0	
				Profit—Interest on Capital invested		306 15 0	
		1,169 4 0				1,169 4 0	

WATER SUPPLY FOR FARMS.

THE "IRONCLAD" OR ARTIFICIAL CATCHMENT.

By A. S. Kenyon, M.I.E., Aust., Engineer, State Rivers and Water Supply Commission.

In the more arid parts of the State, notably the Mallee Country of the North-West, there are areas to which the channel system of water supply cannot be extended, whether for economical reasons or owing to bad running sandy country, or to levels being above command by gravitation, as well as those places where usable water cannot be obtained by boring or well-sinking. In such circumstances, water supply can only be obtained by catchment.

There are, of course, occasional natural catchments of considerable efficiency. These, in the parlance of the Mallee, are known as fifty pointers; that is, they will run and yield useful supplies with smart rainfalls as light as half an inch. They, however, form the small minority. The great majority of natural catchments require a fall of at least an inch in a brief period; many, much more. Tank rains, by which term is meant heavy rains totalling an inch and a half upwards, may be separated by intervals of up to three years. Hence a storage tank, to be reliable, must be capable of holding up to three years' supply. Consequently, water carting from some distant source and the sending of supplies by train becomes necessary.

In designing public storages dependent upon catchment, 20 acres of good catchment are allowed for each 1,000 cubic yards of storage. With 13 inches of rain per annum, and allowing for the three years' period, the run-off expected is, therefore, about 1 per cent. This accords with actual experience. It was observed, also, that although an open storage of 2,000 cubic yards capacity was barely sufficient for the twelve months' requirements of a farm, a five hundred cubic yard tank with closed roof appeared to be ample. The problem was thus narrowed down to two issues—getting a better run-off from a catchment and the prevention of all losses, either by soakage or evaporation, from the water when caught.

Many ways of improving the run-off beyond the obvious one of numerous catch drains were tried. One of the most promising was burning or scorching the surface with a high temperature flame. The machines designed for this purpose in South Australia failed to give satisfaction. Tarring or bitumizing surfaces was found unsuitable, besides being costly. Cement and other concrete coatings were likewise unsatisfactory.

It had been noted that in the Mallee country galvanized iron, whether in the form of tanks, walls, or fences sunk in the ground, or of pieces lying on the surface, appeared to possess an indefinite life. This material is very low-priced. With 26-gauge the cost per square yard is about eighteen pence, while if properly laid it should give a run-off of practically 100 per cent. The next point for consideration was the requirements of an ordinary farm. It was assumed that a supply of

water would be needed for 6 persons, 10 horses, 2 cows, and 150 sheep. The daily consumption at maximum periods was set down at 5 gallons per person, 25 per horse, 8 per cow, and 1½ per sheep, sav 500 gallons. Allowances were then made to provide for distribution throughout the year—

Month.	Gallons Per Day.	Gallons Per Month Approximately.
January	500	15,000
February	460	13,000
March	330	10,000
April	300	9,000
May	200	6,000
June	100	3,000
July	100	3,000
August	80	2,500
September	120	3,500
October	130	4,000
November	300	9,000
December	400	12,000
	250 (*Daily Average*)	90,000 (*Total for year*)

The total, 90,000 gallons, is equal to a little over 530 cubic yards, and represents as nearly as may be estimated the average annual net consumption of water on a farm stocked as above described. These allowances are not likely to vary with locality to any notable extent, but in the next investigation, the rainfall, both as to total amount and as to distribution, is the dominating factor, and it naturally varies considerably from place to place. In the particular case to be described the rainfall averages a little over 12 inches a year. Observation for over 60 years taken by a postmaster were available at a station some considerable distance to the north, where the average was over an inch less. Working on these records by a system of trial and error, it was found that in the worst period on record, a perfect catchment of 26,000 square feet, with a storage having a capacity of 65,000 gallons, would just provide for all the requirements set down above.

An investigation was then made of such a system, using the rainfall results of a station, again an official one at a post office, in the area itself. Here there were 51 years' daily records available. Taking these, and allowing for the monthly consumption set down above, it was found that all requirements were met with an ample margin for unforeseen contingencies. It will be seen from the attached graph that February is the worst month in the year. On seven occasions only was the storage full at the end of that month, whereas in September it was full in 46 out of the 51 years. The longest period without any overflow extended from November, in 1913, to May, 1915, both inclusive, a period of nineteen months, yet the volume in store never fell as low as 23,000 gallons, over one-third full, and was below 40,000 gallons, or two-thirds full, for six only out of the nineteen months. In the 1901-2 drought, the worst yet recorded, there were only thirteen months without overflow, but at the end of May, 1902, only 7,000 gallons were in store. This is the worst case in the whole 51 years' record, yet even if the supply

had been completely exhausted it would not have meant disaster, for as there was no feed that year, there were no sheep. The storage was below 20,000 gallons in four years only—1902, 3 months; 1916, 3 months; 1923, 1 month; and 1927, 2 months; or 9 months out of 612.

The catchment of 26,000 square feet is made up of some 8 tons, equal to 21,400 square feet of 26-gauge sheet galvanized iron, laid on the ground as shown in the illustration, 2,100 square feet of corrugated iron roof to the storage tank, and 2,500 square feet of house and shed roofs which are to be connected to the storage. When the house

Plate 1.—Preparing Ground in Crop Paddock for Catchment.

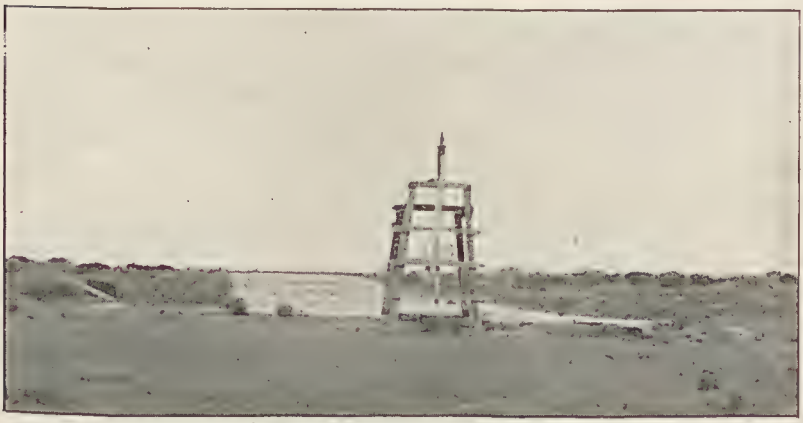

Plate 2.—Catchment installed on site shown in Plate 1.

Note.—Observe growth of protective vegetation barely two months old.

and shed roofs have their own tanks, these should have 7,000 gallons capacity, and the main storage tank could be reduced accordingly. Although shown all in one, it is quite allowable for the installation to be constructed in two or more sections at different points on the farm if desired. The cost of lining the storage tanks would necessarily be increased; for instance, two tanks of 32,500 gallons each would have a greater surface for lining than one of 65,000 gallons, but the additional expenditure would not be great.

The estimated actual expenditure is—

Iron, 8 tons, including freight for 300 miles	£242
Concrete lining tank and bitumen coating, material and labour	100
Roof iron—1 ton	30
Roof framing	20
Pump, skilled labour in roofing, &c.	88
Total	£480

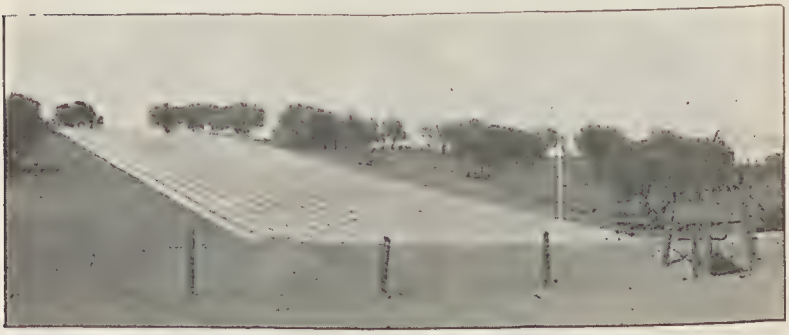

Plate 3.—Cabbage Tree Hill Tank (half size). Completed.

Plate 4.—Dry Tank (half size) showing Tank Roof and Pump.

No allowance is made for carting from railway station, preparing the surface, bending, laying, and punching the iron sheets, excavating storage tanks, about 400 cubic yards, and fencing, these being done by the farmer himself.

Method of Construction.

The details of construction are as follows:—6-ft. x 3-ft. sheets of galvanized plain iron of 26-gauge, with 1½ inch bend up along the sides,

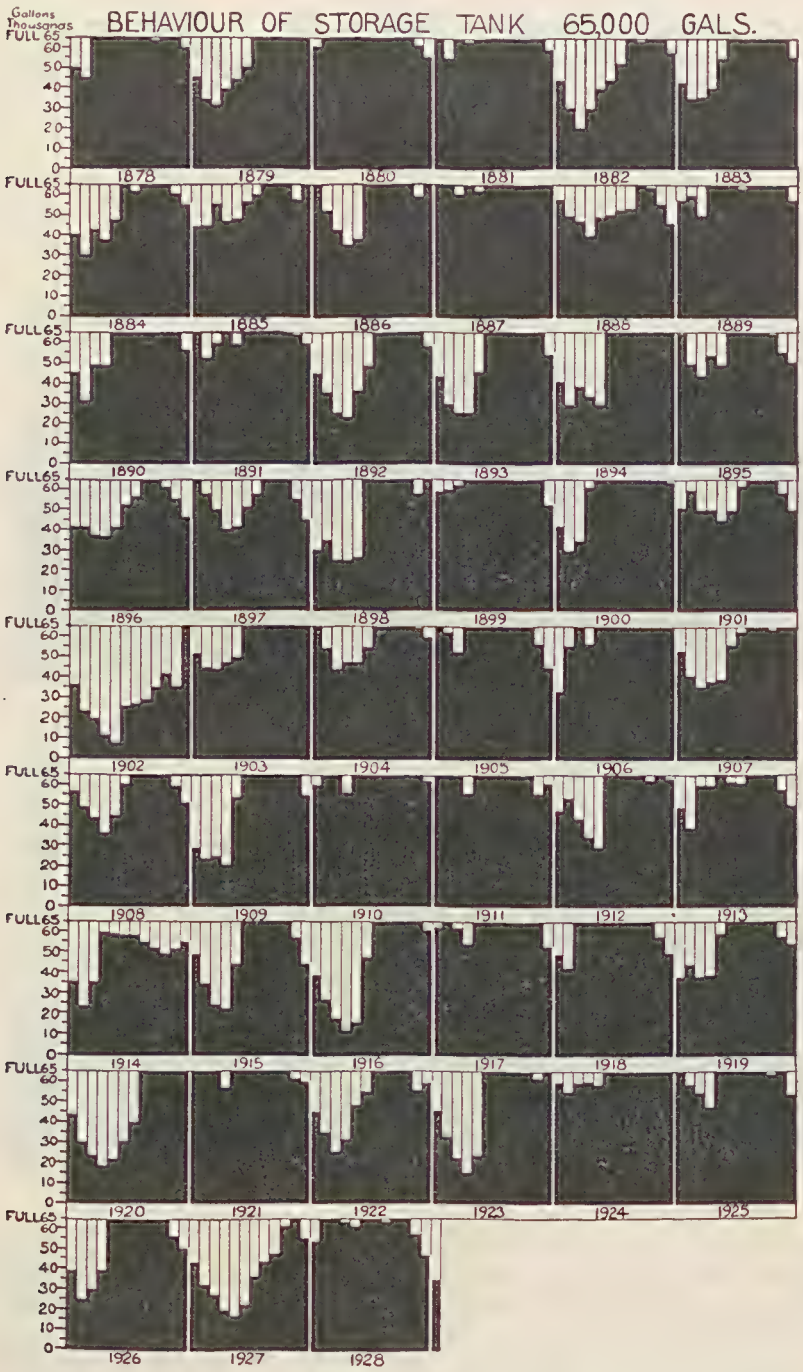

Plate 5.—Showing Monthly Storage in Tank during 51 Years, 1878-1928.

Computed on Euston monthly rainfall on a catchment of 26,000 square feet, and an annual consumption of 90,000 gallons distributed over the year as stated on page 87. The columns represent months and the darkened portions indicate the quantity of water in the tank at the end of each month.

are laid on the ground in rows in the direction of the slope, which is preferably eastern or south-eastern; this direction is desirable so as to avoid the violent winds from the north-west and south. The overlap varies, being 4 inches for slopes up to 1 in 20, and less when steeper. Alternate rows start and end with half-length sheets so that all lap joints are staggered. The longitudinal rows are fastened together by punching a half-inch square hole through the bent-up edges, with a special tongs punch which clamps the edges together. This forms a strong and extremely economical joint, which has the advantage of being readily opened should it be necessary to make repairs or insert new sheets. At a cross-line two sheets from the upper end, the whole catchment is fastened to a timber sill which is bedded in the ground. This allows for the necessary expansion of the iron without any creeping downhill. Around three edges, the top and two sides, the catchment is suitably secured by nailing to logs. The iron at the lower end discharges into a concrete drain leading to the storage tank. The tank, 84 feet x 24 feet at top holding level, 66 feet x 6 feet at the bottom, and holding 9 feet of water, is lined with cement concrete, 3 inches in thickness, coated with bitumen. It is divided into two compartments so that cleaning and other operations may be carried on. An overflow channel leads surplus water away to prevent erosion. The tank is roofed with galvanized corrugated iron 26-gauge, closely sealed all around, and supported on 4 inches x $1\frac{3}{4}$ inch steel joists spanning the tank. An ordinary hand pump is fitted to the tank, which, together with the catchment, is fenced in with a stock-proof fence. A sufficient margin, about 1 chain, is allowed to give room for planting trees to prevent sand drift, and to give protection from winds.

Experimental ironclad catchment tanks of half the above dimensions have been constructed by the State Rivers and Water Supply Commission at Dry Tank, about 4 miles west of the crossing on the Mildura railway line, 5 miles south of Nowingi, and on Cabbage Tree Hill, about $1\frac{1}{2}$ miles north on the turn-off at 10 miles from the Mildura railway line on the Hattah-Meribah-road. At these, rain gauges with sealed retainers are read periodically. A record of contents in store and volumes withdrawn is also kept.

This size of installation is capable of supplying all requirements with the exception of those of a flock of sheep. As in newly-thrown-open country sheep are rarely stocked for some five or six years, it is considered advisable in such case to start with the half-size installations which have 11,000 square feet of sheet iron catchment and 35,000 gallons storage. The outlay on similar lines to the full size outfit is estimated at £250.

WHEAT-GROWING AT NHILL.

Salisbury Plot Results.

The experimental plots conducted by the Department of Agriculture at Salisbury, near Nhill, in co-operation with Mr. E. W. Dahlenburg, are regarded by both growers and departmental officers as among the most reliable and important experiments conducted in the wheat belt. Mr. Dahlenburg is one of the leading wheat-growers of the State, and over the past eight years he has co-operated enthusiastically in the work of determining by scientifically designed experiments the best means of increasing wheat yields in this district. His methods of cultivation have been so thorough and the degree of accuracy so great that the utmost reliance can be placed on the results obtained from these plots. The rainfall in the north Wimmera, in which Salisbury is situated, is somewhat lighter than that obtained at the southern end, and consequently crops in the northern districts mature more rapidly. Conditions, therefore, are markedly different from those of the black soil plains proper. The results of the experimental work have demonstrated this in a number of important instances, such as the most suitable varieties and the best time of sowing.

The outstanding feature of the tests has been the marked superiority of the variety Free Gallipoli, as compared with Federation, Nizam and Wannon. In repeated trials Free Gallipoli, which was bred at the Werribee Research Farm, has beaten Federation consistently, and over a period of six year it has given the highest average yield of the varieties tested. Federation, on the other hand, is at the bottom of the list.

At the head of the list this year is a new crossbred (Currawa x Major x Gallipoli), which yielded at the rate of 29.6 bushels per acre. Free Gallipoli was next with 29 bushels per acre, followed by Mogul (27.8 bushels), Rajah (26.8 bushels), Ranee Selection (26.2), Wannon (25.4), Federation (24.3), and Nizam (23.2 bushels per acre).

Over the six years period the average yields were as follow:—

	Average 6 Years 1923–1928. Bushels per acre.
Free Gallipoli	... 37.0
Rajah	... 36.0
Wannon	... 35.2
Nizam	... 34.9
Federation	... 32.9

An interesting feature of the tests is the fact that the early variety, Rajah, occupies such a prominent place in the yields. Although this variety is not likely to be popular on the black soils, it is one that should command more attention from those growers who are farming Mallee land in the vicinity of Nhill. Rajah is an early variety, and should be useful for sowing late in the season.

The superiority of Free Gallipoli over Federation, as demonstrated by the ordinary variety trials, was shown again this season by the

replicated trials, in which the variety under test is sown on six plots, each of which adjoins a similar plot of the standard variety Federation. In these tests the six plots of Free Gallipoli gave an average yield of 32.6 bushels per acre, while the average yield of the Federation plots was 25.8 bushels—a difference of 6.8 bushels per acre in favour of Free Gallipoli. In a similar comparison of Nizam and Federation, the former variety gave an average yield of 28.1 bushels and the latter 27.1 bushels per acre. With Wannon and Federation the yields were: Wannon, 27.3 bushels per acre, and Federation, 26.8 bushels. This difference of only half a bushel in favour of Wannon is not regarded as significant; in the previous year the results were definitely in favour of Wannon.

Though these trials were carried out in the Wimmera and on black soils, the results are markedly different from those obtained on similar soils at Longerenong, where Federation appears to be more suited by the climatic conditions, and is still holding its own against newer varieties. For conditions at Nhill, however, Free Gallipoli is undoubtedly the superior variety, and the effect of the experiments has been a substantial increase in the area sown to Free Gallipoli, and the gradual displacement of Federation.

Manurial Trials.

An interesting feature of the manurial tests at Salisbury has been the discovery that the land on which the trials have been conducted is unusually rich in phosphates. For that reason it has not given a profitable response to dressings of superphosphate beyond ½ cwt. per acre. The manurial plots are duplicated, one set being sown on winter fallow and the other on summer fallow. The yields last year and the averages for the past two years are shown in the following table:—

	Yield, 1928.		Average Yield, 1927, 1928.	
	Winter Fallow.	Summer Fallow.	Winter Fallow.	Summer Fallow.
	bushels p.a.	bushels p.a.	bushels p.a.	bushels p.a.
No manure	23·5	20·3	21·5	20·1
Super., ½ cwt. per acre	26·7	25·2	23·0	22·1
Super., 1 cwt. per acre	26·1	24·1	22·0	20·9
Super., 1½ cwt. per acre	26·3	23·3	22·1	20·4
Super., 2 cwt. per acre	25·3	23·4	21.3	19·3

The average yields of all the manurial plots since the inception of the tests in 1920 are as follows:—

	Average 9 Years 1920-1928. Bushels per acre.
No manure	... 33.8
Super., ½ cwt. p.a.	... 36.4
Super., 1 cwt. p.a.	... 36.6
Super., 1½ cwt. p.a.	... 36.9
Super, 2 cwt. p.a.	... 36.4

Comparative tests of summer and winter fallow have been made in this district during the last five years. In the first three years the summer fallow proved definitely superior to the winter fallow, but over the last two years this superiority has not been maintained.

WANGARATTA CROP AND FALLOW COMPETITION, 1928.

Report of the Judge, W. B. Miller, M.Agr.Sc., Inspector of Agriculture.

Favorable conditions for wheat-growing have been experienced in the North-eastern district during the past two years. In 1927 record crops were obtained and, judging by the fifteen crops exhibited in the competition conducted by the Wangaratta Agricultural Society, the district average for 1928 will again be high. The competing crops were expected to average between 9 and 10 bags per acre.

The outstanding features of the rainfall during the year were the remarkably heavy rains during the first three months (approximately 13 inches), the fortunate absence of waterlogging rains in the winter, and the excellent spring rains of from 3½ to 4½ inches during September and October. The total rainfall to 31st October was 26 inches.

Crop of Free Gallipoli grown by Mr. N. Sandford, Boralma.

Record yields were expected, but observations during the winter period showed that the majority of the crops had not stooled as heavily as usual. Possibly this was due to the excessive autumn rainfall, and the consequent heavy weed growth having depleted the soil of essential plant foods. The comparative success of paddocks ploughed from grass in February, cultivated well in March, and then sown early, tends to support that belief.

The wheat yield was also diminished by attacks of red rust. The wheat heads were smaller than in 1927, and in a few cases only were three grains across found in the spikelets. Rust had been noticed during the autumn and winter, but it spread rapidly in the spring and undoubtedly affected the filling of the grains in many cases. No varieties were found free from rust, but Federation and Nizam suffered most severely.

Time of Sowing.

Probably the most important factor in successful wheat-growing at Wangaratta is the time of sowing. Seldom are crops sown after the third week of May as successful as those sown earlier, and the risk of complete failure due to waterlogging is much greater with late sowing. Another factor in favour of early sowing is that valuable sheep feed may also be obtained by feeding off the young crop in July without appreciably affecting the wheat yield. This fact is generally recognized, but the extent of the decrease in yield caused by delayed sowing is not always appreciated.

Although the 1928 winter was comparatively dry, it is significant that the heaviest crops exhibited in the competition were sown early in May.

The Heaviest Crop in the Competition—Free Gallipoli—grown by Mr. D. P. Jones, Milawa.

Time of sowing tests with Federation wheat at the Rutherglen Experiment Farm in 1928 resulted as follows:—

Sown 1st week in May	..	..	28.0	bushels	per	acre.
„ 3rd „ „ „	..	..	24.6	„	„	„
„ 2nd „ „ June	..	..	16.7	„	„	„

In very few wheat-growing districts is the time of sowing so important as in the north-east. The number of working horses used on the majority of the farms could be profitably increased to ensure cultivation and sowing at the optimum time.

The average amount of seed used by competitors was 74 lb., and of superphosphate 104 lb. per acre. The amount of seed sown could profitably be increased to 90 lb. per acre, particularly when sowing Free Gallipoli wheat. There is little danger of the crop being too thick in

such a district as Wangaratta, but it may often be too thin, due to faulty germination. Five of the six heaviest crops were of the Free Gallipoli variety, which is now very popular in the district.

The heaviest crops were sown on good fallow, ploughed from pasture in the spring of 1927. It is evident that highest yields per acre may be obtained by such a rotation, but very profitable returns may be obtained by taking several crops from such a paddock before allowing it to go back to pasture again for a few years.

Generally speaking, the crops were free from such diseases as takeall, flag smut, and ball smut, but a considerable amount of loose smut was present in many of the crops. In several cases the wheat was not as true to type as is desirable.

Results.

Competitor.	Variety.	Yield.	Type.	Absence of Disease.	Absence of Weeds.	Evenness.	Crop Total.	Fallow Total.	Grand Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
N. Sandford	Free Gallipoli ..	31	18	14	14	14	91	99	190
J. Pearce	Free Gallipoli ..	32	18	14	14	14	92	95	187
D. P. Jones	Free Gallipoli ..	35	17	13	11	14	90	94	184
A. McDonald, No. 1 ..	Eclat	30	18	15	13	14	90	94	184
F. O'Keefe, No. 1 ..	Free Gallipoli ..	29	18	14	14	14	89	95	184
Bailey Bros., No. 1 ..	Baroota Wonder	28	19	13	14	14	88	95	183
Bailey Bros., No. 2 ..	Free Gallipoli ..	32	17	13	13	14	89	93	182
I. Atkinson, No. 2 ..	Waratah ..	26	18	15	13	14	86	96	182
H. J. Klemm ..	Minister ..	24	19	13	15	14	85	96	181
F. O'Keefe, No. 2 ..	Waratah ..	26	18	15	13	14	86	94	180
R. A. Sadler, No. 1 ..	Waratah ..	26	19	15	12	13	85	94	179
A. McDonald, No. 2 ..	Free Gallipoli ..	25	18	14	13	14	84	95	179
I. Atkinson, No. 1 ..	Free Gallipoli ..	25	19	14	12	14	84	94	178
Docker and Richardson	Federation ..	18	18	14	13	13	76	96	172
R. N. Sammon ..	Major ..	23	14	14	11	12	74	88	162

Comments on the Crop.

The crop competition resulted as follows:—First, J. Pearce; second, N. Sandford; third, A. McDonald and D. P. Jones. With the exception of Milawa, where an extra inch of rain was received, the spring rainfall was fairly evenly distributed throughout the district. Seasonal conditions appeared to favour the crops on the heavier loams, but the success of the leading competitors was mainly due to sound farming methods.

Mr. J. Pearce's winning crop of Free Gallipoli was grown on new ground fallowed to a depth of 6 inches in August, 1927. The fallow was then harrowed in October, spring-toothed in January, scarified in February after nine inches of rain, and harrowed after rain in March. It was scarified again before sowing with 75 lb. of dry pickled seed and 95 lb. of super. per acre at the end of April. The resulting crop was tall, clean, and very dense. It was fed off lightly until mid-July. But for a few odd heads of barley it was true to type. Although the heads were not very large the crop should yield heavily if not affected by the little rust present.

Mr. Sandford, who won the fallow competition, also grew Free Gallipoli, but the crop was not as tall, and hardly as thick as the winning crop. It was similar in other respects.

As described in the report of the fallow competition judged in March, the paddock had been cultivated for many years. It was spelled in grass for two years before being fallowed in August, 1927. Harrowing took place twice in the spring, followed by the disc in January. The scarifier was used shallowly both before and after the February rains, and again in April. Sowing took place in the first week of May, was 70 lb. of seed and 1 cwt. of superphosphate per acre.

A Promising Wheat Variety, Eclat, selected and named by Mr. A. MacDonald, and grown by him at Wangaratta.

This sheaf of well-filled heads obtained first prize at the Melbourne Royal Show, 1928.

The heaviest crop in the competition was one of Free Gallipoli grown by Mr. Jones, of Milawa, but many marks had to be deducted for the presence of strange heads, weeds, and vetches. Mr. Jones seldom fallows this rich land, where the average rainfall is higher than at Wangaratta, and the country is used largely for dairying purposes. The crop was remarkable for its well developed heads, but the presence of rust may have affected the grain.

Messrs. Bailey Brothers' crop of Free Gallipoli was the heaviest seen at Taminick, and was estimated to yield as heavily as the winning

crop. The seed, however, must have been mixed, as the crop contained many strange heads, notably of the Turvey variety. 75 lb. of seed and 106 lb. of superphosphate were used per acre.

Mr. H. McDonald, of Docker's Plains, showed a nice crop of Eclat, a variety selected and developed by himself some years ago. The heads were true to type and larger than was usual this year. The fallow had been well worked in the spring, and again in the autumn, to kill the weeds that grew rapidly. It was sown rather late, at the end of May, with 70 lb. of seed and 130 lb. of superphosphate per acre.

Mr. F. O'Keefe's crop was sown on fallowed land that had not been spelled for many years. His fallow had been well worked, and the wheat was sown early, with 75 to 85 lb. of seed, and 1 cwt. of superphosphate per acre. The yields were good considering the number of years the land had been cropped without a spell.

The crops of Messrs. Sadler and Atkinson, on the lighter loams at Taminick, were thin, wild oats, mustard, and wild turnip being more prevalent than usual.

The yield of Mr. Klemm's crop of Minister wheat was reduced by takeall, and probably also by feeding off too heavily.

Messrs. Docker and Richardson, who sowed rather late, were unfortunate in obtaining a poor germination, due to heavy rain falling immediately after the drilling had been completed.

The number of entries in the crop competitions has been increasing each year, and it is hoped that the members of the Agricultural Society will continue to maintain their efforts to improve production methods in this way.

KANIVA FALLOW AND CROP COMPETITIONS.

Report of the Judge, A. B. Hackwell, B.Agr.Sc., Science Field Officer.

The auspicious beginning of the past season gave promise of very heavy yields being obtained throughout the Wimmera. In most centres, unfortunately, a shortage of rain in the early spring, and in some cases frost, prevented this possibility being attained. In this respect the Kaniva district was an exception, for there the early hopes were realized, and farmers enjoyed an excellent season.

The estimated yields of the twelve crops entered in the open section averaged between eleven and twelve bags per acre, and of the total 28 crops inspected, between ten and eleven bags.

In addition, there were many other crops in the district which apparently were up to the standard of those entered in the competition. These satisfactory returns obviously were due to up-to-date methods, combined with favorable weather.

The rainfall records for Kaniva show that, although the total for the period June-November, 1928, was an inch below normal, the rain over the two critical months of September and October was some two inches heavier than usual.

Rainfall Records, Kaniva.

—	1928.	42 Years' Average.
	Points.	Points.
January	129	61
February	239	76
March	82	77
April	96	116
May	134	205
June	133	237
July	243	202
August	39	209
September	227	200
October	338	149
November	29	120
December	15	101
Total	1,704	1,753
Total January-May	680	535
„ June-November	1,009	1,117
„ September and October ..	565	349

The entries received in all sections totalled 60, including 38 for crops and 22 for fallows.

The Crops.

A feature of the competition was the high, even standard of the crops, and to decide between the leaders in each section was a matter of difficulty.

The popularity of Free Gallipoli was evidenced by the fact that 16 of the 28 exhibits had been sown with this variety; Wannon and Federation were the only other wheats shown. The crops on the whole had filled remarkably well, and displayed no sign of tipping. In only one corner of the district was evidence of frost apparent, and even then only in scattered heads.

Of the total 24 entries in the strong land and medium or mixed section, nineteen had been sown from late May to early June, and the four on clay land from early to mid-May. Practically all the crops had been fed off till the end of July.

The average rate of seeding of the crops entered in the competition was 73 lb., varying between 60 and 86 lb. per acre.

The amount of superphosphate applied ranged from 83 to 130 lb., the majority of competitors favoring 1 cwt. per acre.

Flag smut, loose smut, and dead heads were common, but not to a serious extent. Ball smut was found in three crops.

The amount of "rubbish" present varied considerably. Many entries were comparatively clean, but a number contained an abundance of wild oats and undergrowth.

The awards are as follow:—

Open Crop.—Best 75 Acres.—12 Entries.

Competitor.	Variety.	Apparent Yield.	Purity and Type.	Absence of— Weeds.	Absence of— Disease.	Evenness.	Total.
Maximum Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
O. Webb & Elborough	Free Gallipoli ..	35	18	14	14	14	95
S. M. Champness ..	Free Gallipoli ..	35	18	13½	14	13½	94
J. Graham ..	Free Gallipoli ..	33	18	14	14	13	92
Crouch Bros. ..	Free Gallipoli ..	32	18	14	14	13½	91½
O. A. Hendy & Sons	Free Gallipoli ..	31	18	14	14	13	90
H. H. Sanders ..	Free Gallipoli ..	32	18	14	13	13	90
S. R. Champness ..	Free Gallipoli ..	30	18	13	14	13½	88½
E. Champness ..	Federation ..	31	17	13½	13½	13	88
J. R. Coutts ..	Free Gallipoli ..	27	18	14	14	13½	86½
B. R. Anderson ..	Federation ..	28	17	14	11	12	82
J. C. Grant ..	Free Gallipoli, Wannon, Federation	27	16	11	14	13	81
E. Carter	Wannon, Federation	23	16	12	11	12	74

In this section a number of the outstanding crops in the district were entered, and competition was very keen.

The entry of Messrs. Webb and Elborough was awarded 95 points, and narrowly gained first place over Mr. S. M. Champness' entry with 94 points. Both these exhibits had been sown with Free Gallipoli, on competition fallow.

The winning crop was very even, had filled exceedingly well, and gave promise of an excellent yield. Very little disease was present. A few strangers showed up and, except for an odd spear thistle, it was free from weeds.

This crop was grown on a heavy flat that had been summer-fallowed with the plough in March to 4 inches, harrowed twice in winter, scarified and twice harrowed before harvest, then scarified late in May. It was put in with the combine during the second half of June, with 65 lb. of formalin-pickled seed and 1 cwt. of 24 per cent. superphosphate per acre, and fed off until the second week of August.

A splendid exhibit, from which a very heavy return was expected, was submitted also by Mr. S. M. Champness. Portion of the area contained some exceptionally good crop—tall, dense, level, with well packed heads—but the entry as a whole was not quite as even as the winning crop. An occasional stranger, and a little flag smut, were present, also an odd wild oat and a few patches of undergrowth.

This crop had been sown at the end of May, with 75 lb. of dry pickled seed and 105 lb. of 24 per cent. superphosphate per acre, and was fed off early in July. The fallow had been prepared as follows:—About one-third was summer fallowed with the plough in March, the balance ploughed in June, and the whole then harrowed and scarified in July, harrowed August, scarified September, combined and harrowed November, harrowed January, combined March, then harrowed in mid-May.

Mr. J. Graham's entry was also of high standard, and obtained third place with 92 points. It had filled well and promised a highly satisfactory yield, but showed misses in the drilling.

Excellent crops were submitted also by several of the remaining competitors in this section.

Messrs. Hendy and Sons entered 50 acres of their No. 1 exhibit, together with 25 acres of remarkable crop, which, although grown on a very short fallow, ranked with the heaviest crop inspected in the competition. The land had been ploughed to 5 inches in February, 1928, harrowed and combined in May, and sown at the end of June with 75 lb. of Free Gallipoli and 1 cwt. of superphosphate per acre.

Originally it was intended not to sow this land with wheat in 1928, but the early favorable conditions caused a change of plans.

Strong Land Section.—13 Entries.

Aggregate for best 75 acres of fallow, 1927, and crop on same, 1928.

Competitor.	Variety.	Apparent Yield.	Purity and Type.	Absence of Weeds.	Absence of Disease.	Evenness.	Crop Total.	Fallow Total.*	Grand Total.
Maximum Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
S. M. Champness ..	Free Gallipoli ..	35	18	13½	14	13½	94	98	192
F. J. Vivian, No. 1 ..	Free Gallipoli ..	34	16	14	14	14	92	99	191
O Webb and Elborough	Free Gallipoli ..	35	18	14	14	14	95	94	189
H. H. Sanders ..	Free Gallipoli ..	32	18	14	13	13	90	97	187
E. Champness ..	Federation ..	31	17	13½	13½	13	88	97	185
F. J. Vivian, No. 2 ..	Wannon	33	14	13	13	13	86	95	181
Crouch Bros. ..	Wannon	30	16	11	13	13	83	97	180
J. C. Grant	Free Gallipoli, Wannon, Federation	27	16	11	14	13	81	97	178
H. H. Sanders and Hutchings	Wannon ..	28	16	14	12	13	83	94	178
John Coutts ..	Free Gallipoli ..	27	18	11	12½	12	80½	96	176½
J. C. Grant and H. Lowen	Free Gallipoli, Wannon, Federation	33	16	13	14	14	90	86	176
S. R. Champness ..	Federation ..	22	15	12	11	11	71	97	168
D. J. Coutts ..	Federation, Wannon	22	18	10	13	13	76	91	167

* Points as awarded for fallows, 1927, by Mr. R. Blackwood.

Messrs. S. M. Champness obtained the highest total with 192 points (fallow 98, crop 94). Mr. F. J. Vivian was a close second with 191 points (fallow 99, crop 92), and Messrs. Webb and Elborough third with 189 (fallow 94, crop 95).

The crops exhibited by the competitors who came first and third in the total were the same as entered in the open section, and have been commented on thereunder.

Mr. Vivian's crop of Free Gallipoli, grown on the leading 1927 fallow, was particularly thick and somewhat flaggy. It was expected to furnish a highly satisfactory yield, although the heads were smaller than those of the other leading crops.

It was unfortunate for this entry that extra points were lost on the score of purity of seed. Through an accident a butt or two of Wannon had been mixed with the Free Gallipoli seed at cropping time. The crop was relatively clean, and with little disease. Occasional heads that were apparently frosted were scattered throughout. After harvest the fallow had been worked with the combine in February, March, and May, and the crop sown in mid-June with 80 lb. of dry pickled seed and 1 cwt. of superphosphate per acre, and fed off at the end of July and early August.

Medium or Mixed Land Section.—9 Entries.

Aggregate for best 75 acres fallow, 1927, and crop on same, 1928.

Competitor.	Variety.	Apparent Yield.	Purity and Type.	Absence of Weeds.	Absence of Disease.	Evenness.	Crop Total.	Fallow Total.*	Grand Total.
Maximum Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
Crouch Bros. ..	Free Gallipoli ..	32	18	14	14	13½	91½	97	188½
O. A. Hendy and Sons, No. 1	Free Gallipoli ..	30	18	14	14	13	89	98	187
S. R. Champness ..	Free Gallipoli ..	30	18	13	14	13½	88½	96	184½
John Coutts ..	Free Gallipoli, Federation	31	18	12	13	13	87	94	181
O. A. Hendy and Sons, No. 2	Federation ..	29	18	13	13	13	86	92	178
A. R. Tink and W. Cooper	Free Gallipoli, Federation	31	15	11	14	13	84	93	177
B. R. Anderson ..	Federation ..	28	17	14	11	12	82	93	175
F. S. Thompson ..	Wannon	24	17	9	11	12	73	97	170
E. G. Thompson ..	Federation ..	23	18	10	12	11	74	95	169

* Points as awarded for fallows, 1927, by Mr. R. Blackwood.

The leading crop in this section was submitted by Messrs. Crouch Brothers, and it gained 91½ points, and gave the entry the highest aggregate with 188½ points.

It promised the heaviest yield in the section, and was relatively clean and showed little disease. After harvest the fallow had been scarified and harrowed in February, after rain, combined a week later, and scarified and harrowed early in May. The seed had been dry pickled and sown at 70 lb. per acre, with 1 cwt. of superphosphate, during the last week of May, and the crop fed off till July.

This crop was also entered by Messrs. Crouch in the open section, and gained fourth place.

The second highest aggregate was obtained by Messrs. Hendy and Sons' No. 1 entry, which consisted of a crop of Free Gallipoli sown on fallow that had been awarded 98 points. Although this entry was expected to furnish a satisfactory yield, it was not so heavy as the winning crop, nor was it quite so even. It had been sown at the end of June with 75 lb. of formalin-pickled seed and 1 cwt. of superphosphate per acre, and fed off till early August.

Mr. S. R. Champness' crop gained 88½ points, making his entry third in the aggregate with 184½ points. Seventy-five lb. of dry pickled seed and 1 cwt. of superphosphate per acre were sown early in June and the crop fed off at the end of July.

Light Sandy Loam or Clay Section.—4 Entries.

Aggregate for best 75 acres fallow, 1927, and crop on same, 1928.

Competitor.	Variety.	Apparent Yield.	Purity and Type.	Absence of Weeds.	Absence of Disease.	Evenness.	Crop Total.	Fallow Total.*	Grand Total.
Maximum Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
J. R. Coutts ..	Free Gallipoli ..	27	18	14	14	13½	86¼	95	181½
John Coutts ..	Federation, Free Gallipoli	26	18	13½	14	12	83½	91	174½
H. H. Sanders ..	Free Gallipoli, Wannon	22	17	14	13	12	78	94	172
B. R. Anderson ..	Free Gallipoli ..	18	18	13	14	10	73	88	161

* Points as awarded for fallows, 1927, by Mr. R. Blackwood.

First place in the aggregate was awarded to Mr. J. R. Coutts with 181½ points; second to Mr. John Coutts, 174½ points; and third to Mr. Sanders, 171 points.

The best crop in this section was submitted by Mr. J. R. Coutts. It was well headed and fairly even throughout, and had been grown on the fallow which obtained the highest points in 1927. This fallow was subsequently spring-toothed in March, scarified April-May, and sown immediately with 60 lb. of dry pickled seed and 100 lb. of 24 per cent. super. per acre. It was harrowed after sowing, and fed off in July.

Mr. John Coutts' crop was second, being slightly lower in yield, less even, and showing a few more weeds. The seed was dry pickled, and sown early in May at 65 lb. per acre, with 92 lb. of super., and the crop fed off from mid to late July.

Third place was obtained by Mr. Sanders' entry, the yield of which was affected by the presence of poorly-filled heads, apparently due to frost. The crop was relatively free from weeds, but was penalized for unevenness and for a little flag smut. It had been sown in mid-May with 75 lb. of dry pickled seed and 93 lb. of super. per acre, and was harrowed after sowing, and fed off in mid-July.

The Fallows.

Of the 22 entries inspected twelve were allotted to the strong land class, six to the medium or mixed, and four to the light sandy loam or clay. The exhibits, on the whole, were of high standard, as was expected from the good farming methods general throughout the district.

The majority of the competitors presented an area of summer fallow; in the strong land section the whole or portion of each entry had been prepared in this way.

Strong Land Section.—75 Acres.—12 Entries.

Aggregate for best fallow, 1928, and crop on same, 1929.

Points Awarded for Fallows, 1928.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Maximum Points	**25**	**25**	**25**	**25**	**100**
E. Champness	24	24	24	24	96
S. R. Champness	23	24	25	23	95
O. A. Hendy and Sons ..	24	23	25	23	95
D. J. Coutts	23	23	25	23	94
H. H. Sanders	23	23	24	23	93
S. M. Champness	23	23	24	22	92
F. S. Crouch	24	23	23	22	92
H. Diprose	23	23	23	22	91
E. Carter, No. 1	21	22	25	21	89
O. Webb and Elborough ..	22	22	24	21	89
E. Carter, No. 2	21	22	24	21	88
W. J. Crouch	23	22	22	21	88

Mr. E. Champness submitted an excellent fallow, which gained first place with 96 points. The area consisted mostly of black land in first class order. It also contained a few heavy red patches, which had worked down remarkably well into clods about 2 to 3 inches in diameter. Mr. Champness has found that for stiff red clay to be worked down into this satisfactory condition it must be ploughed early. This fallow had been ploughed to 3½ inches in April with the mouldboard, cross-harrowed mid-June after rain, scarified across the ploughing at the end of June and early July, cross-scarified at the end of August and early September, and again in early November, and harrowed about a week later

Another splendid fallow was shown by Mr. S. R. Champness, who came equal second with 95 points. This entry was on black ground that contained a few patches of red loamy clay. It had been ploughed with the mouldboard in March-April, harrowed early in May, scarified at the end of June, harrowed July, spring-toothed mid-September, scarified in October, and harrowed in November. Compared with the winning fallow it lost a point on moisture, and the seed bed in places was not quite so level.

Messrs. Hendy and Sons exhibited a very creditable fallow, which shared second place. It showed good moisture, with an absence of weeds, but the mulch, as a whole, was on the shallow side. The land had been ploughed in April, combined in July, August, September, and again in October, then harrowed in November.

Medium or Mixed Land.—75 Acres.—6 Entries.

Aggregate for best fallow, 1928, and crop on same, 1929.

Points Awarded for Fallows, 1928.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Maximum Points	**25**	**25**	**25**	**25**	**100**
O. A. Hendy and Sons ..	22	23	24	23	92
H. H. Sanders & Hutchings	22	22	23	22	89
O. Webb & Elborough ..	20	22	25	21	88
A. L. Arthur	21	22	24	20	87
J. R. Coutts & A. R. Tink	21	22	23	20	86
B. R. Anderson	23	21	22	19	85

Messrs. Hendy and Sons' exhibit in this section comprised 60 acres of black ground with red patches, and 15 acres of stiff red clay in the adjoining paddock. A good job had been made of the entry as a whole, and it gained first place with 92 points. It had been summer fallowed in March with the mouldboard plough, combined in July, August, and September, then combined and harrowed at the end of October.

Messrs. Sanders and Hutchings' entry obtained second place with 89 points. Less than half the area was black land, in very fair condition, the remainder, of red land, both loamy and heavy, showed irregularities in the bed and in places a shallow mulch. The land was undercut in March to 4-5 inches, scarified and harrowed in June, scarified July, and combined in September and again in October.

An uneven paddock was submitted by Messers. Webb and Elborough, who came third with 88 points.

Light Sandy Loam or Clay Section.—75 Acres.—4 Entries.

Aggregate for best fallow, 1928, and crop on same, 1929.

Points Awarded for Fallows, 1928.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Maximum Points	**25**	**25**	**25**	**25**	**100**
J. R. Coutts	21	22	24	21	88
A. Coutts	24	20	23	20	87
B. R. Anderson	22	21	21	19	83
John Coutts	19	21	23	20	83

First place in this section was awarded to Mr. J. R. Coutts, who submitted a paddock that varied in soil type from light sandy loam to stiff clay. The mulch on about half the area was on the shallow side, and the moisture content in places comparatively low. After being ploughed to 4½ inches in June the land was harrowed twice in August, cultivated in September and October, and portion again in November.

The paddock entered by Mr. A. Coutts was of a light nature, mostly grey, sandy loam. The moisture content was good; a few weeds were

present, and the mulch, on the whole, was somewhat tight, indicating that an additional working would have been of advantage. The land had been ploughed with the mouldboard in June, and combined in August and October.

Mr. Anderson showed a very uneven piece of land, with numerous crabholes; and Mr. John Coutts a paddock that had been fallowed for the first time.

In conclusion, my thanks are extended to the officers and members of the society for their assistance and hospitality during the time of judging.

NHILL CROP AND FALLOW COMPETITIONS, 1928.

Report of the Judge, W. B. Miller, M.Agr.Sc., Inspector of Agriculture.

Nhill wheat-growers experienced three dry years, in 1925, 1926, and 1927, and a reversal of the weather conditions during 1928 was confidently anticipated. It seemed, when abnormally good rains fell in January, February, March, and April, that these hopes were to be fulfilled. In each of these months the rainfall was above the average. The fallows, which had been prepared in a dry season, were thoroughly saturated, and ideal conditions prevailed for their cultivation before sowing what was expected to be a record crop.

Owing to the fear of continuous wet weather, the crops were sown rather earlier than usual, the majority of them being in the ground before the end of May. An excellent germination was obtained, and although the winter rains were lighter than usual, the crops promised well until they met the dry spell in August and September. For eight weeks prior to the end of September practically no rain was recorded, and high winds dried the soil out rapidly. In most cases the crops withstood this test well, but on the 28th September a hot north wind was experienced, and they suffered severely. On the following day, however, heavy rain fell and relieved what had appeared to be a hopeless position. The rains continued in October, the total fall after the dry period amounting to approximately 3 inches. The crops recovered remarkably well, and though a little damage was caused by frost at the end of October, very satisfactory yields of both wheat and oats were obtained. It was expected that the average yield of the nineteen crops entered in the open crop competition would be about ten bags per acre, and hay crops of 1½ tons per acre were common.

Rainfall Variations.

Such returns in an adverse season are a tribute to the farming methods employed by the Nhill and district farmers. In such an unusual season it is probable that the treatment given to the fallows after the February rains, the time of sowing, and the stage of maturity of the crops during the critical time at the end of September had a greater effect on the yield than the cultivation treatment given to the fallows in the preceding year. In addition, the rainfall throughout the district was by no means uniform.

The average annual rainfall in the districts from which the competitors are drawn is shown in the following table, together with the records for 1928:—

	Average Rainfall.	Total Rainfall, 1928.	Sept.-Oct., 1928.
	inches.	inches.	inches.
Nhill ..	15.9	14.4	3.7
Kaniva	17.5	16.9	5.6
Winiam	16.8	16.3	4.6
Woorak	16.0	13.6	3.6
Glenlee	15.0	16.6	3.8
Lorquon	15.9	14.5	3.4

Crop of Free Gallipoli grown by Mr. F. Moar.
Yield 11 bags per acre.

It will be seen that the Kaniva and, to a less extent, the Winiam districts were favoured by heavier rains in the spring, and, generally speaking, the heavier crops were found there. Among the crops on black land between Nhill and Kiata those sown last were the best. Those sown in June, which is really the normal sowing time, were better than those sown in May. The majority of the early-sown crops, especially those not fed off by sheep, suffered very severely during the dry spell. The same may be said of the crops in the Mallee land, which are always earlier than those on the black flats.

Diseases.

The crops on the black land were very free from weeds, and only traces of diseases were noticed. Where takeall, flag smut, and rust were seen the yield had not been materially reduced. On the red land,

however, and particularly on the red clay patches, many deadheads and heads containing shrivelled grains were found. In some cases this was due to takeall, and in others to the hot winds. Very little loose smut was noticed.

Varieties.

An outstanding feature of the competition was the popularity of the variety Free Gallipoli. It was represented in fifteen out of the nineteen entries in the open crop competition, and appeared as though it would yield better than the other varieties, which were Wannon, Federation, Nizam, and Rajah. It is interesting to note that in 1924 only one competitor (Mr. E. W. Dahlenburg) used this variety, which has since given the highest average yield in the official tests conducted on his farm at Salisbury.

Part of the Crop of Free Gallipoli which won First Prize in Section 10—Whole of a Farmer's Wheat Crop.

Frosts.

Many of the crops were thick enough to yield thirteen bags per acre, but in nearly all cases the heads were smaller than usual, and very seldom showed three grains across. Very little "tipping" occurred, but in some cases it was noticed that two or three grains were missing, usually at the centre part of the head. Close examination showed that probably this had been due to the effects of frost at flowering time preventing fertilization of the embryo grains. All parts of the head do not flower at the same time, and it was fortunate that the frosts had only been sufficiently severe to kill those embryo grains which happened to be at their weakest stage on the morning of the frost. More serious damage from frost was found at Dimboola, and in the southern Wimmera.

The Competition.

A record number of entries, 57 for the crops and 34 for fallows, were judged, and the competition was keenly contested.

The competition for the Lienert-Todd Trophy, which is designed to promote the better working of stiff red soils, will be subject of a special report.

Awards—Section I.—Best 75 Acres of Wheat Crop.

Competitor.	Variety.	Yield.	Type.	Absence of—		Evenness.	Total.
				Weeds.	Disease.		
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
H. H. Sanders ..	Free Gallipoli ..	35	18	14	14	14	95
P. Bone	Free Gallipoli and Nizam	32	19	15	14	14	94
C. P. Dahlenburg	Free Gallipoli ..	31	19	15	14	14	93
R. C. Blackwood	Free Gallipoli ..	30	19	15	15	14	93
F. W. Kluge and R. Blackwood	Free Gallipoli ..	31	19	14	15	14	93
F. Moar, No. 2 ..	Federation and Free Gallipoli	32	18	14	15	14	93
J. and T. W. Rintoule	Federation and Free Gallipoli	30	18	15	15	14	92
R. G. Anderson ..	Free Gallopoli ..	31	19	13	14	13	90
Eric Dahlenburg	Nizam, Free Gallipoli, and others	29	19	13	15	14	90
E. G. Hoffman ..	Free Gallipoli and Federation	29	18	15	14	14	90
R. Dickinson, No. 1	Free Gallipoli, Federation, Wannon	28	18	14	15	14	89
W. S. Blackwood	Nizam	28	18	14	15	14	89
E. W. Dahlenburg, No. 1	Free Gallipoli ..	28	19	14	14	13	88
F. Moar, No. 1 ..	Free Gallipoli ..	29	17	13	15	14	88
E. Reichelt ..	Wannon	26	18	14	14	14	86
R. Dickenson, No. 2	Free Gallipoli, Wannon, Federation	25	18	14	15	13	85
C. Reichelt ..	Free Gallipoli ..	24	18	14	13	14	83
E. W. Dahlenburg, No. 2	Free Gallipoli ..	22	19	14	13	13	81
J. Dart	Federation and Rajah	18	18	14	13	14	77

The nineteen crops entered in this section were all sown on fallowed black land, and in most cases on summer fallow. Where part of the crop in the same paddock was sown on summer fallow and part on winter fallow, little difference could be seen between the crops on the two classes of fallow. The greater part of the fallowing on the black land at Nhill is now done in the summer, as it is the more convenient time; and fortunately it usually leads to higher yields.

The winning crop of Free Gallipoli wheat shown by Mr. Sanders at Miram promised to yield heavily. The crop was very thick and the heads large and well filled. Some deadheads were present, and the crop had been slightly affected by rust and frost. Nevertheless, it was

easily the best entry seen. This may be attributed partly to the more generous spring rains received in the Kaniva district, but the cultivation methods used by Mr. Sanders were very sound.

The summer fallow on which the crop was grown had been ploughed from grass with the sundercut in March, 1927. It was scarified in June, again in July, and then harrowed. Cultivations were given in September, November, and again after the February rains. In May the paddock was cross-cultivated and harrowed; 75 lb. of seed and 93 lb. of superphosphate per acre were sown with the combine during the first week in June and harrowed three days after sowing. In July and August the crop was heavily fed off by sheep, and was not in ear until after the October rains.

Second prize was awarded to Mr. P. Bone for a crop of Free Gallipoli, with some Nizam grown on heavy black ground at Kiata

Homestead of Mr. C. P. Dahlenburg, a Prominent Competitor in the Nhill Competition.

Mr. C. Towns, the veteran secretary of the Nhill Agricultural Society, is in the centre of the picture.

East. It was very clean, true to type, free from disease, and well drilled. It appeared to be ripening more evenly than were the majority of the crops in the district.

The paddock had been summer fallowed with the sundercut in February and March, scarified in July, combined in August and in October, and again after the February rains. The crop was sown with the combine at the end of June, 75 lb. of seed and 90 lb. of manure being used. It was one of the last crops to be sown in the district, and was not fed off. At the time of the hot winds in September it was very backward, but grew rapidly after the October rains.

It was difficult to make a choice between Mr. Bone's entry and that of Mr. C. P. Dahlenburg—a crop of Free Gallipoli—but it was thought

that the heads of Mr. Dahlenburg's crop were not quite so well filled. It was sown in the last week in May, harrowed later, and fed off by sheep in August.

Mr. Moar's No. 2 entry at Diapur was one of the heaviest crops shown, but lost an extra point for foreign heads of wheat in the crop. The crops on the property of Messrs. R. Blackwood and R. Anderson, at Kiata, were very good but were not quite equal to those of the winners.

Mr. Eric Dahlenburg's crop was the only one sown on red loam, and it appeared to be the best on the farm of his father, Mr. E. W. Dahlenburg. This crop was sown early, in the third week of April, and was fed off by sheep in June. As is usual in a dry year, the crops on loamy soil withstood the dry time better than those on the flats. The paddock had been out to grass for three years before being winter fallowed in July. Deadheads, due to both takeall and frost, reduced the yield considerably. Plots of Nizam, Free Gallipoli, Baldwin, Waratah, Hard Federation, and Federation were included in the paddock. Baldwin is a hard wheat, new to the Nhill district, but it did not do well this season. Woorak seemed to be the driest part of the district this year, and Mr. Reichelt's crops were not up to his usual standard.

Mr. Dart's crop on new land had been badly burnt, but he kindly showed it in order that he might give the judge the benefit of his close observations during the season.

The average amount of seed sown per acre was 74 lb. No indications that a lighter seeding would have been more profitable were seen. The average amount of manure used was 100 lb. per acre.

Awards—Section 10—For the Whole of a Farmer's Fallow, 1927, and the Wheat Grown on said Fallow in 1928.

Competitor.	Area (acres).	Yield.	Type.	Absence of—		Evenness.	Total. Crop.	Fallow, 1927.	Grand Total.
				Weeds.	Disease.				
Possible Points..	..	**35**	**20**	**15**	**15**	**15**	**15**	**100**	**200**
R. C. Blackwood ..	150	29	19	15	14	13	99	94	184
H. H. Sanders ..	220	30	18	14	13	13	88	95	183
J. and T. W. Rintoule	270	29	18	14	15	13	89	90	179
J. R. Coutts ..	95	29	18	13	13	13	86	92	178
John Coutts ..	270	29	18	12	14	12	85	92	177
E. W. Dahlenburg ..	350	24	19	13	14	13	83	93	176
F. W. Kluge and R. Blackwood	255	28	19	14	14	13	88	87	175
E. Reichelt ..	200	23	18	13	13	13	80	91	171
C. P. Dahlenburg ..	290	25	18	13	14	13	83	87	170
R. Dickenson ..	200	24	18	13	14	13	82	87	169
E. G. Hoffman ..	200	26	18	14	13	13	84	81	165
P. Bone	350	24	19	13	14	12	82	83	165
C. H. Reichelt ..	340	21	18	13	13	12	77	88	165

Mr. R. C. Blackwood showed 150 acres of Free Gallipoli in two paddocks. One crop of 100 acres included his entry in section 1, and

was a dense crop throughout, and of medium height. The benefits of extra moisture were evident by the heavier crop grown in a gully. The value of gypsum for stiff red land was shown on a couple of acres in this paddock. Two tons of gypsum per acre had been applied to this patch five years ago, and the crop growing on it this year was nearly as good as that on the black land alongside.

The paddock had been summer fallowed, and was scarified twice and cultivated once in 1927. In February it was cultivated, and scarified in May. Seventy-five pounds of seed and 140 lb. of superphosphate pere acre were sown with the combine early in June. This crop was not fed off. The remaining 50 acres of crop was not quite so heavy, but there was not very much difference between the two crops.

Mr. H. Sanders won in the crop section, but is one point behind Mr. Blackwood in the aggregate. As well as the crop entered in section 1, he had a slightly lighter crop of Nizam in the same paddock. The third crop, Wannon and Federation, was grown on a loamy hill, and contained many deadheads. The heavy crop in the first paddock, however, enabled him to retain the lead.

The entry of 270 acres of crop by Messrs. J. and T. W. Rintoule was very creditable. In the first paddock of 150 acres Free Gallipoli and Federation were sown. The part of the crop sown last, during the first week of June, was the best, and the crop grown on winter fallow appeared to be heavier than that sown on summer fallow. The second paddock, containing Wannon and Nizam, was not much thinner. Some wild oats were showing, however, although the paddock had been spelled for three years prior to fallowing.

Cresco Cup.

Section 9.—For the Whole of a Farmer's Fallow, 1926, and the Crop on the said Fallow; also the Fallow for 1927, and the Crop on the said Fallow, 1928.

Competitor.	Fallow, 1926.	Crop, 1927.	Fallow, 1927.	Crop, 1928.	Total.
Possible Points—	**100**	**100**	**100**	**100**	**400**
R. C. Blackwood	93	89	94	90	366
J. and T. W. Rintoule	92	81	90	89	352
E. W. Dahlenburg	95	79	93	83	350
E. G. Hoffman	92	92	81	84	349
F. W. Kluge and R. Blackwood	85	83	87	88	343
E. Reichelt	84	87	91	80	342
P. Bone	93	80	83	82	338
C. F. H. Reichelt	92	79	88	77	336

This competition, lasting over three years, is very exacting, and Mr. R. C. Blackwood thoroughly deserves his success. By virtue of their uniformly good crops this year Messrs. J. and T. W. Rintoule have gained second place. Mr. E. W. Dahlenburg, who showed 350 acres, was unfortunate to lose his place owing to the comparative weakness of one paddock containing some heavy red land.

Section 2.—Best 75 Acres of Wheat Crop on Mallee Land.

Competitor.	Variety.	Yield.	Type.	Absence of—		Evenness.	Total.
				Weeds.	Disease.		
Possible Points ..	.. .. ..	35	20	15	15	15	100
R. D. Buckley ..	Free Gallipoli ..	30	19	14	15	14	92
C. F. H. Reichelt..	Currawa & Federation	30	19	14	14	14	91
H. McKenzieau and J. C. Buckley	Free Gallipoli ..	31	18	13	15	13	90
T. G. Marshall ..	Federation ..	27	19	13	15	14	88
C. R. Buckley ..	Free Gallipoli ..	28	18	12	15	13	86

Crop of Oaten Hay grown on Stubble Ground at Nhill by Messrs. J. and T. W. Rintoule.
(1½ tons per acre.)

The majority of the crops on the Mallee land north of Nhill this year were rather too advanced to obtain full benefits from the rains in October. Many of them were tipped, especially on the heavy flats. Those shown in the competition, however, were expected to average six bags an acre, which is satisfactory for such a season.

Mr. R. D. Buckley sowed his winning crop of Free Gallipoli in mid-June, which is rather too late for maximum returns on Mallee land in an average year. Some wild oats were present, as was the case in nearly all the Mallee crops, but practically no disease, except some rust, was seen. The crop was true to type, and Mr. Buckley had handpicked it for barley. The paddock was winter fallowed in July with the mouldboard plough, and then harrowed. In the winter and spring it was harrowed three times. After the rain in February, and also in March, the scarifier was used. In mid-June 80 lb. of seed and 75 lb. of superphosphate per acre were combined in.

Mr. Reichelt grew Currawa and Federation on his block of sandy Mallee soil. Takeall and flag smut had thinned the crop out, and some stinkwort was present. The fallow was prepared with the sundercut in October, being late winter fallow. It was spring-toothed in November, February and April, and sown with 75 lb. of seed and 90 lb. of manure per acre early in May.

Messrs. Mackenzie and Buckley's crop was as heavy as any, but lost points because of the presence of many weeds, and also for uneven drilling. The remaining two crops were sown earlier, and were much thinner. The spring rains at Lorquon were the lightest in the district, and the crops of Messrs. Marshall and C. R. Buckley had not recovered as well as those at Glenlee.

Section 3.—Best 50 Acres of Wheat Grown on Red Fallowed Land.

Competitor.	Variety.	Yield.	Type.	Absence of—		Evenness.	Total.
				Weeds.	Disease.		
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
J. R. Coutts ..	Free Gallipoli ..	31	18	14	13	13	89
E. G. Nuske ..	Free Gallipoli ..	27	20	13	15	13	88
John Coutts ..	Federation ..	27	19	13	14	13	86
C. P. Dahlenburg	Federation and Baldwin	22	19	13	14	14	82

None of the crops shown in this section was grown on the heavy red ground, but all on lighter loams. Mr. Coutts's crop was outstanding, being the best portion of his entry in section 10. The fallow had been spring-toothed in March, scarified in April, and sown in May, with 60 lb. of wheat and 1 cwt. of manure per acre.

Mr. E. G. Nuske had a fine crop for the Lorquon rainfall. The fallow had been very thoroughly cultivated last year, but special efforts were made to conserve the summer rains. Immediately after the February rains the paddock was harrowed, it was combined early in March, and harrowed again after further rain. After cultivating again in May, sowing took place in the second week in June, with 60 lb. of seed and 90 lb. of manure per acre. Similar treatment given to a paddock which had been cut for hay last year had resulted in a seven-bag crop, but where less cultivation was given the stubble crops were a failure.

Fallows.

Although the cultivation of fallows in preparation for this season's crop occupied much time last summer, farmers found time to prepare a large area of summer fallow. In many cases it was impossible to obtain a good burn before fallowing owing to the heavy undergrowth among the stubble. Where flag smut and takeall were seen in last season's crop it is advisable to burn as early as possible. Special provision has been made by the Government this year in order to allow farmers to burn the stubble earlier than usual.

Sheep were relied upon to keep the fallows clean during the sowing period. In the springtime, however, it was evident that the weeds grew too rapidly for the sheep to cope with them, and in some cases wild oats had been allowed to seed before the fallow was cultivated.

Some difficulty was experienced in allotting places to the leading fallows, as they were uniformly good. As was expected, their moisture content was not very high, and owing to the absence of cultivation in August and September, due to the dry period, the seed-beds were hardly as well consolidated as usual.

Section 4.—Best 75 Acres of Black Fallowed Land.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Possible Points	**25**	**25**	**25**	**25**	**100**
E. G. Hoffman	23	24	23	24	94
E. W. Dahlenburg	21	24	24	24	93
J. and T. W. Rintoule	22	23	24	23	92
F. Moar, No. 1	21	23	25	23	92
F. W. Kluge and R. Blackwood	22	23	24	23	92
C. P. Dahlenburg	21	23	25	23	92
H. H. Sanders	22	23	24	23	92
Robt. Blackwood	22	23	23	23	91
P. Bone	21	23	24	23	91
F. W. Kluge and R. Blackwood, No. 2	21	24	24	21	90
F. Moar, No. 2	21	23	23	23	90
E. Reichelt	20	23	24	23	90
Eric Dahlenburg	20	23	24	22	89
Hutchings and Sanders	21	22	23	22	88

Mr. E. G. Hoffman showed the winning fallow made from a heavy black flat which had been farmed on the rotation of grass-fallow-wheat. The moisture content was the highest seen. An even mulch of 3 inches covered a well consolidated and even seed-bed. Points were deducted for some dead barley grass which had been allowed to get away in the spring, and for a few young thistles. Every opportunity had been taken to work the fallow. It was summer fallowed with the sundercut at the end of February, and combined after the completion of sowing at the end of May. Harrowing took place twice in June, and the spring-tooth was used in July and October, followed by a stroke with the harrows in November.

Mr. E. W. Dahlenburg's fallow was well and evenly cultivated, but showed less moisture than the winner's. This may be explained by the fact that Mr. Dahlenburg summer fallowed before the February rains, and although he scarified in April and June, the latter scarifyings were not given until the end of the month. The rigid-tyne combine was used in July and at the end of October.

The remaining fallows were very nearly as good as those of the winners, only minor details separating them.

Section 6.—For the Best 75 Acres of Black Fallowed Land, 1928, and the Crop on the said Fallow, 1929.

The entries for this section were as in section 4, with the exception of the No. 1 entry of Mr. Kluge.

Section 8.—For the Best 75 Acres of Black Fallowed Land, 1928, Crop on the said Fallow, and 75 Acres of Fallowed Land, 1929, and Crop on the said Fallow, 1930.

The details of the entries in this section are the same as those in section 6—the progress totals being as follow:—

Competitor.	Fallow, 1928.
E. G. Hoffman	94
E. W. Dahlenburg	93
J. and T. W. Rintoule	92
F. Moar	92
F. W. Kluge and Robert Blackwood	92
C. P. Dahlenburg	92
Robert Blackwood	91
Eric Dahlenburg	89

Section 5.—For the Best 50 Acres of Red Fallowed Land.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Possible Points	**25**	**25**	**25**	**25**	**100**
C. P. Dahlenburg	22	23	25	23	93
J. R. Coutts	21	22	24	22	89
John Coutts	18	21	22	21	82

Section 7.—For the Best 75 Acres of Red Fallowed Land, 1928, and the Crop on the said Fallow, 1929.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
C. P. Dahlenburg	22	23	25	23	93
H. R. Coutts	20	22	24	21	87
John Coutts	18	21	22	21	82

The three entries in sections 5 and 7 were of loamy red soil covering a dark red subsoil. Mr. Dahlenburg's fallow was in particularly good order, and had been thoroughly worked after ploughing in July. The mulch was 3 inches deep, and the seed-bed very even.

Mr. J. R. Coutts's fallow was rather shallowly mulched in some places, and on the heavier ground was low in moisture content. It is advisable to cultivate the red ground deeper than the black ground.

Mr. John Coutts had difficulty in fallowing a virgin paddock of red soil. Although the mulch was rather rough and the tussocks of black grass still remained, it should be possible to get this paddock in good order before sowing.

GOULBURN VALLEY INTER-DISTRICT CROP COMPETITION.

Report of the Judge, J. Brake, B.Agr.Sc., Senior Inspector of Agriculture.

The first and second prize crops of Yarrawonga, Cobram, Numurkah, Nathalia, Shepparton and Dookie districts this year competed in an inter-district competition for the best crop in the Goulburn Valley, the prize being a trophy presented by Cresco Fertilizers Limited.

The local competition at each place was decided by a farmer judge appointed by the Farm Competitions Association, after which the two leading crops in each district were inspected and judged.

The standard of the crops as a whole was much lower than is usually seen in this portion of the State, and without belittling the

The Winning Crop—Major—grown by Messrs. R. Pogue and Sons, Shepparton.

merit of Messrs. Pogue and Sons' winning exhibit, it should be pointed out that the missing of some heavy rains in some districts was responsible for big reductions in yields.

The condition of the crops in regard to type and purity was not satisfactory, three or four of the exhibits carrying more strangers than should be seen in prize-winning crops; there was also some variation of type even in the leading crops, which were tall and promised very heavy yields.

Barley was found in one instance, and there was a sprinkling of wild oats in practically every crop. With the exception of flag smut, disease was scarce. Flag smut is characterized by the veins of the leaves becoming choked with spores of the smut. Generally, heads are not formed, although they may occur in a season which favours the development of the plant rather than the disease. The spores, like those of takeall, may fall and lie in the soil to attack the next wheat crop. Prevention methods consists of burning stubbles, growing in

rotation with the wheat a crop resistant to the disease, such as oats, and, finally, working the fallow well to bring about the germination and subsequent death of many of the spores which may be present in the soil.

There is a tendency, around Nathalia, to neglect the burning of stubbles, mainly in order to save the grazing for stock; this should be discouraged on wheat land, because of the danger of allowing flag smut spores to persist, infecting the soil and the crop more and more each year. The loss caused by flag smut is, perhaps, not so apparent

In the Crop of Messrs. R. Pogue and Sons.

as that caused by ball, or loose smut; nevertheless, the probabilities are that to-day flag smut is responsible for at least as much loss in Victoria as both the others together.

The Crops.

An excellent exhibit of Major wheat gained first prize for Messrs. R. Pogue and Sons, of the Shepparton Society. The slight variations in type usual to this variety were noticed, also traces of loose and flag smuts; but, beyond these, no faults could be found with the crop. It received full points for yield, and was awarded 98 points out of a possible 100.

Awards.

Name.	Society.	Variety.	Seed.	Super.	Pickle.	Points for Yield.	Purity and Type.	Absence of—		Evenness.	Total.
								Weeds.	Disease.		
Possible Points ..	.. ..	.. .. ..	..	..	.. ..	**35**	**20**	**15**	**15**	**15**	**100**
			lb.	lb.							
R. Pogue and Sons ..	Shepparton ..	Major	73	90	Dry ..	35	19	15	14	15	98
Hastie and Sons ..	Shepparton ..	Major and Wannon	72	75	Dry ..	35	17	13	14½	12	91½
A. J. Gall	Dookie ..	Ranee	80	160	Dry ..	27	19	14	14	14	88
R. Hammon ..	Yarrawonga ..	F. Gallipoli ..	75	90	Dry ..	27	19	13	13	12	84
E. Bott	Yarrawonga ..	Bomen	60	100	Dry ..	22	19	14	14	13	82
Formby H.	Numurkah ..	Major	85	90	Dry ..	21	19	14	13	13	80
W. C. Maher ..	Dookie ..	Major	70	98	Formalin	22	17	14	13	13	79
E. D. Vivian ..	Numurkah ..	Federation ..	75	83	Bluestone	22	17	13	13	12	77
W. S. Collie	Cobram ..	F. Gallipoli ..	62	70	Dry ..	19	19	13	13	12	76
J. S. Popplewell ..	Cobram ..	F. Gallipoli ..	74	120	Dry ..	13	19	14	14	15	75
J. Flanner	Nathalia ..	Federation ..	80	100	Bluestone	12	17	14	10	14	67
J. W. Lancaster ..	Nathalia ..	Federation ..	70	65	Dry ..	8	17	14	13	13	65

The land was ploughed 5 inches deep with a mouldboard in June, harrowed and cross-harrowed; it was graded and rigid-tyne cultivated in August. After the summer it was worked with the combine in February, and again in May, then sown after the latter working with dry pickled seed at the rate of 73 lb. per acre, and superphosphate at 90 lb. per acre.

Messrs. T. Hastie and Sons, also of the Shepparton Society, gained second place with the two varieties Major and Wannon; the bulk of the exhibit, however, consisting of Major. The seed for this crop was dry pickled and sown in mid-May, at the rate of 72 lb., with 75 lb. of super. per acre. It was estimated that the yield would approximate that of the winner, but points were lost by Mr. Hastie because of the presence of other varieties, also a few thistles and weeds. The evenness and general appearance of the crop were not nearly so good as those of the winning crop, and consequently several points were lost on that score. The aggregate award was 91½ out of 100.

A Dookie crop, on a brown loamy soil, gained third prize with 88 points. This was sown by Mr. A. J. Gall, of Cosgrove, the variety being Ranee. Fallowing in this case was later than that for the leading crops. The paddock was ploughed with the mouldboard in September and harrowed. The latter operation was repeated in early October, and again towards the end of the same month. Scarifyings were carried out in November, at the end of January, and in April, May, and June, and the land was harrowed and sown with the combine followed by the harrows in late June. Dry pickled seed was used at the rate of 80 lb. per acre, with 160 lb. of super. per acre.

The awards for all competitors are shown on page 119.

BEULAH CROP AND FALLOW COMPETITION.

Report of the Judge, P. Ryan, B.Ag.Sc., Inspector of Agriculture.

Residents of Beulah claim that, taking one season with another, their district is one of the most reliable wheat-producing centres in the State, and it must be admitted that, in spite of the dry conditions experienced in the spring, the crops grown there this year are a good advertisement for the district. There is no doubt that the soils with their sandy nature and good red subsoil are well adapted for growing crops on a rather light rainfall, and, when proper attention has been paid to the preparation of the fallow, are not so severely affected by a dry spell as are the heavier soils a little further south. Moreover, a study of the rainfall records shows that while Beulah, in common with most of the wheat centres, experienced a shortage of rain in August and September, the deviation from normal in this district was not so marked. In addition, the effects of the dry spell were mitigated by a few opportune showers which prevented the wheat from wilting, and enabled it to come away well when the good rains fell at the end of September. The country to the west of Beulah seemed to have been particularly favoured in this respect, and the crops there were better than in other parts of the district.

At the time of judging, the competition crops on the whole were well headed and appeared to be filling nicely. In only one entry did

grainless heads, caused by frost at flowering stages, come under notice. In this instance there were four varieties sown in the same paddock, but only the Federation and Penny were affected. Apparently these varieties were in flower when the frost occurred, which the result that the florets were damaged and fertilization did not take place.

The Prevalence of Ball Smut.

Considering the high standard of the crops in other respects, it was was disappointing to find ball smut in no fewer than five of the entries. It is true that in only one case was the infection serious, but as this disease can be prevented absolutely by careful pickling, the presence of even one affected head in a competition crop is proof that the work has not been done with sufficient thoroughness. Some of the crops in which ball smut was present had been pickled with formalin, and others with dry copper powder, showing that the efficacy of the treatment depends not so much on the choice of pickle as on the care with which the work is carried out. The points to be observed in using formalin are (1) the solution should be of the proper strength, i.e., 1 lb. of formalin to 45 gallons of water; (2) the seed should be immersed for three minutes and all the unbroken smut balls skimmed off. This can be best done if the wheat is poured into a perforated hopper, which is then immersed in the solution. The wheat can then be thoroughly stirred, and any unbroken smut balls, which always rise to the surface, can be removed. If the wheat is pickled in the bag, the farmer should not attempt to treat a whole bag at a time; rather should he break the bag into two or three "butts." The mouth of the butt is then rolled back, and the bag rinsed up and down in the solution,and then allowed to stand on the bottom of the container. If the wheat is then stirred, the smut balls will float and can be skimmed off. (3) Care should be taken to prevent re-infection from smutted bags, by treating them with the solution. With copper carbonate the amount of powder recommended is 2 ozs. per bushel, and it is essential that every grain should be thoroughly dusted with the powder. From the results observed it seems apparent that some of the machines on the market are not satisfactory in this respect.

In one or two crops rust was present, but in no case was it serious enough to affect the yield. Penny still retains its place as easily the most popular variety in the district, though some farmers are beginning to try out the newer wheats, such as Nizam, Free Gallipoli, and Ranee. Penny seems to do particularly well at Beulah, but those who have commenced to grow the newer wheats mentioned are advised to compare carefully their yields as against those obtained with Penny. In appearance these wheats are likely to be disappointing as compared with Penny, which makes such a bold showing, but they generally yield better than their appearance would lead one to hope, and the wheat which fills the bag is the one the farmer requires.

The average rate of seeding for the competition crops was 76 lb., with 98 lb. of super. per acre. In a normal season at Beulah a dressing of at least 1 cwt. of super. should give profitable returns.

Crop Competition.

There were seventeen entries in the open crop competition, and Mr. F. J. Hofmaier was placed first with a heavy crop of Penny. This crop was comparatively free from weeds and disease, but lost points on

account of drill misses. Mr. L. Thompson was second with a crop of Penny, which was very heavy in parts, but was a little uneven. Third place was awarded to Mr. E. P. Willian with a nice crop of Federation.

Open Crop Competition—Best 100 Acres of Wheat.

Competitor.	Yield.	Trueness to Type.	Freedom from—		Evenness.	Total.
			Weeds.	Disease.		
Maximum points ..	35	20	15	15	15	100
F. J. Hofmaier, No. 1 ..	32	17	14	14	12	89
L. Thompson	31	18	13	13	12	87
E. P. Willian	29	18	12	14	13	86
James Howie	28	17	12	14	13	84
A. Couzener	26	18	13	12	14	83
John Howie	25	18	12	14	14	83
F. Scroope	26	17	12	14	14	83
A. E. Hofmaier	26	18	14	12	13	83
Bodey Bros., No. 1 ..	26	17	13	14	13	83
F. J. Hofmaier, No. 2 ..	26	16	13	14	13	82
J. J. P. Millard	25	17	13	14	13	82
W. J. Collins	27	16	14	11	13	81
Bodey Bros., No. 2 ..	22	17	14	14	12	79
W. Murray and Sons ..	22	19	13	13	12	79
E. P. Willian	24	18	12	12	12	78
A. Collins	21	15	12	14	12	74
L. Byron	18	17	13	13	13	74

The land on which Mr. Hofmaier's crop was grown was fallowed 4½ inches deep in March with the sundercut, cultivated with the springtooth cultivator three times before harvest and four times after harvest, each cultivation being given after rain. The crop was sown on the 6th May, at the rate of 75 lb. of seed and 112 lb. of super. per acre. The seed was pickled with copper carbonate.

A record of the early workings of the fallow on which Mr. Thompson's crop was grown were not available, as Mr. Thompson came into occupation after these had been given. He cultivated it with the springtooth cultivator in March, and the crop was sown in the last week in May with the combine with harrows attached. Eighty pounds of seed and 130 lb. of super. were sown per acre, and the seed was pickled with copper carbonate.

Mr. Willian ploughed his land in March, harrowed it immediately, and cultivated it with the combine in June, April, and May. The crop was sown in the middle of May with 70 lb. of seed and 90 lb. of super. per acre. The seed was pickled with copper carbonate.

Combined Crop and Fallow Competition.

Owing to a misunderstanding, there were only three entries for the combined crop and fallow competition, in which the prize is awarded to the competitor gaining the highest aggregate points for the fallow judged last year and the crop grown on that fallow this year. The crops in this section were not nearly equal to those entered in the open

crop competition. Mr. F. J. Hofmaier's entry of Penny was easily the heaviest crop of the three, but lost points on account of the presence of ball smut.

Competitor.	Yield.	Type.	Absence of Weeds.	Absence of Disease.	Evenness.	Total Crop.	Total Fallow.	Grand Total.
Maximum points	35	20	15	15	15	100	100	200
F. J. Hofmaier	27	17	14	10	11	79	95	174
Sanders Bros.	20	18	13	13	12	76	96	172
W. Murray & Sons ..	20	19	13	14	12	78	90	168

Fallow Competition.

There were eighteen entries in the fallow competition, and the exhibits on the whole were of a very high standard. Mr. L. Brennan gained first prize, and was also placed equal with Mr. A. E. Hofmaier for second place.

Awards—Best 100 Acres of Fallow.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Possible Points	25	25	25	25	100
L. Brennan, No. 3 ..	23	23	25	23	94
L. Brennan, No. 2 ..	23	23	24	23	93
A. Hofmaier	23	23	24	23	93
W. J. Collins	24	22	24	22	92
J. C. Scott	23	22	24	22	91
L. Brennan No. 1 ..	22	23	24	22	91
W. G. Chivell	22	21	24	24	91
W. Murray and Sons ..	22	22	24	23	91
W. A. Martin	22	22	24	22	90
John Howie	23	22	23	21	89
Bodey Bros.	21	22	22	22	87
O. H. Collins	22	21	24	22	89
R. J. Collins	21	21	24	22	88
F. Scroope	22	21	23	22	88
Sanders Bros.	22	21	24	21	88
Bodey Bros.	22	21	23	22	88
Sanders Bros.	22	21	22	21	86
L. Byron	21	21	22	21	85

Mr. Brennan ploughed his land 2½ inches deep with a mouldboard plough in June, harrowed it immediately, cross-harrowed it a fortnight later, and cultivated it with the combine in the second week in October.

Mr. Hofmaier's fallow was ploughed the second week in June with a skim plough and harrowed immediately. It was cultivated with the combine in July and harrowed immediately after. It was cultivated with the combine in early October, then cross-cultivated with the same implement and harrowed.

Mr. W. J. Collins ploughed his land in the middle of July, harrowed it early in August, cultivated with the combine at the end of September, and again early in November.

MANURES FOR BEANS.

Tests at Kalimna.

Two years ago, the Department established on the farm of Mr. H. Rowe, at Kalimna, a series of experimental plots, the object of which was to determine the most suitable fertilizer dressing for use on the bean crop. Last season, the plots were sown on 22nd August with Canadian Wonder beans in rows 2 ft. 3 in. apart, at the rate of 1¼ bushels per acre.

In the first year of the tests the plots dressed with the various fertilizers were compared with "no manure" check plots sown alongside, and the increases due to the application of superphosphate and the combination of superphosphate and sulphate of ammonia were very large indeed. Because of this and the fact that practically all the bean growers at Kalimna used fertilizers of some kind, it was decided that the check plots should be dressed with superphosphate at the rate of 1 cwt. per acre. In this way it was hoped, by the use of the replicated system of sowing the plots, to obtain more accurate information as to the relative value of the different manures and combinations of manures. Each manurial treatment was repeated six times, and a check plot dressed with superphosphate 1 cwt. was sown alongside each test plot. Under this system it was possible to calculate the reliability of the figures obtained.

Unfortunately, the accuracy of this year's results was affected by an uneven germination, particularly in the heavier manured plots, but, while they lacked definite significance, they were in general agreement with the results obtained last year. Superphosphate by itself and in combination with sulphate of ammonia increased the yield, but sulphate of ammonia by itself, not only did not give any increase, but, by lengthening the growing period, made the first picking—the most valuable from the grower's point of view—a very light one.

The yields for the year were as follow:—

Plot.	Yield of Green Beans—Average of Six Plots.	Yield of Check Plot (super. 1 cwt. per acre)—Average of Six Plots.	Increase or Decrease compared with Check Plot.
	lb. per acre.	lb. per acre.	lb. per acre.
No manure	1,710	1,872	dec. 162
Super., 3 cwt. per acre ..	1,636	1,778	dec. 142
Sulphate of ammonia, 1 cwt. ..	1,614	2,395	dec. 781
Super.,3 cwt., and sulp. ammon., 1 cwt.	2,939	2,481	inc. 458
Super.. 3 cwt., sulp. ammon., ½ cwt., and sulph. of potash, ½ cwt.	2,450	2,444	inc. 6

PASTURE TOP-DRESSING.

Experiments at Moorooduc.

In response to a request from the Moorooduc Progress Association, the Department of Agriculture last year laid down on the farm of Mr. H. Slaney a series of experimental plots to determine what advantages might be expected from top-dressing pastures under the conditions obtaining in that district.

The experimental field is a light grey loam typical of a large area in the district at present covered with scrub. Prior to being top-dressed, it carried a sole of native grasses and weeds. Although the application of the manures was made somewhat late, the phosphates have increased the bulk of grass, in addition to bringing about a substantial increase in the number and extent of the clover patches. No advantages were to be seen as a result of the application of nitrogenous manures.

Subterranean clover was sown on one portion of the plots and made good growth there, but elsewhere only odd plants were to be found. The small native trefoil, suckling clover, had responded well, and was much taller and more dense on those plots treated with superphosphate, especially where 2 cwt. of super. per acre had been used.

It has not been possible to measure the carrying capacity of the various plots, but in order to obtain an indication of the differences the bulk plots were cut with the mower, and the produce cured and weighed as grass hay.

The yields were as follow:—

No manure	.. ..	2.47 cwt. per acre.
Super., 1 cwt. per acre	..	4.96 „ „
Super., 2 cwt. „	..	6.86 „ „

ORCHARD AND GARDEN NOTES.

The Orchard.

Young Trees.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

Fumigation.

Evergreen trees including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, if the foliage of the trees be thoroughly dry.

Fumigation of citrus groves is now being carried out by Departmental officers under the management of the Citriculturist.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

Horses.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

Cattle.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the droppings, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available. It will pay well to feed crushed oats to good cows. Provide the following lick for cows:—

Salt, 40 lb.
Bone flour, 20 lb.
Sulphur, 15 lb.
Lime, 25 lb.
Potassium iodide, 5 ounces.

Pigs.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now. Pollard should be used for very young pigs, and bran for suckling sows, and to help to prevent constipation.

Sheep.—Towards the end of March, the earliest of the northern lambs are due (late October matings), and all ewes in the northern district should be kept strong for lambing. Crutching is essential, particularly if ewes are likely to become dirty in the autumn. Wool should be cleared from udders and well up over the tail. Young ewes of the merino or fine crosses are very apt to suffer if not crutched, and lambs may be lost in bad weather if this work is not attended to at the proper time. Clear wool from eyes also in the case of fine-wooled sheep. Handle ewes carefully when crutching if near lambing, as losses may result from rough treatment. Pure British breeds of ewes and coarse cross-breds may be still coming into season; in such cases, rams should be left mated to make sure of a good lambing.

In almost any season foot-rot is common. Attention should be given regularly in such cases. Pare the foot (except the extreme tip of the toe) with a sharp pair of pruning shears and strong knife, and remove the diseased parts. Then apply some form of treatment; some of the patent mixtures are very good for the purpose. A mixture made as follows will be found satisfactory:—Take one quart of good Stockholm tar, and warm it until it becomes thin, and then add a cupfull of powdered bluestone, and mix well (sometimes it will take quite a time to mix the tar and the bluestone thoroughly); then add two teaspoons of lysol and stir well, and then a little turpentine (just sufficient to make the mixture as thin as paint). Apply with a flat brush.

Ready attention should be given to all cases of fly, ophthalmia, grass-seed blindness, casting, pizzle trouble, &c.

It may pay to feed oats or other concentrates to breeding ewes in low condition, in preparation for lambing. Stocks of these foods should be secured while the market is favorable for their purchase.

Reserve the best paddock near the homestead for the lambing ewes, if possible. Ample supplies of good water is still a vital necessity until the weather breaks.

Poultry.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. The regular use of Epsom salts and sulphur once a week for the next three months, combined with strict cleanliness, will act as a safeguard against chicken pox; 1 oz. of salts and ½ oz. of sulphur to every twenty birds should be given in the mash—salts one day, and sulphur three days after. Burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Drinking water should be kept in cool shady spot.

CULTIVATION.

Farm.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

Orchard.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

Vegetable Garden.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

Flower Garden.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

Vineyard.—Select scions, if not done last month. In cooler districts, where ripening of grapes is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to temperature control and acidity; correct latter, if deficient, with tartaric acid or late grapes. Acidimeter supplied by Department; price 10s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

BEE-KEEPING.

During February bees commence to arrange their stores of honey and pollen in preparation for the coming winter, and it is therefore unwise to interfere with the combs in the brood chamber, to insert empty combs between the brood, or to change the position of the combs.

Where there is a surplus of honey in the upper story, it is best not to take the whole of it in one operation, but to take half, and when the emptied combs are filling up again take what was left. At this time of year bees will work better and keep on breeding longer with a full, or partly filled, super than with empty combs above the cluster of bees.

When there is a shortage of honey in February or March, it is best to give only enough sugar syrup to carry the bees through till April, but to give whatever amount is necessary in the shortest possible time. Feeding extending over many days will stimulate brood-rearing, and a few weeks later the bees will be short of food again, compelling further feeding.

In the case of colonies below the normal strength in the number of bees, continuous light feeding will do no harm; it will, on the contrary, be beneficial, as it increases the number of young bees, but the feeding for winter stores should be deferred till the middle of April, when but little of it will be used for brood rearing.

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A strong-growing annual, with succulent fleshy stems and broad, soft leaves. The lowers are cream or pale yellow in colour and are clustered together in a compact, ylindrical spike.

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All kinds of stock eat it readily, and it may be given to them at any stage of growth; it does not taint milk in the slightest degree.

This Clover will re-seed itself in a pasture on good land and thus become practically permanent. Sow 8 to 12 lb. per acre in drills, or 20 to 30 lb. broadcast.

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Ne Plus Ultra, 2/6 lb.; Kangaroo (Bronze-top varieties), 2/- lb.

(Sow 3 lb. of Seed per acre.)

RAPE

(Sow 4 to 6 lb. per acre in drills; 8 to 12 lb. broadcast)

omner's "Tip-Top" True Giant Kangaroo Rape (We are the original introducers)—**10d.** lb.; **84/-** cwt.

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White Mustard—Sow with Rape at the rate of 1 to 2 lb. per acre, as it prevents blowing. **1/6** lb.; **150/-** cwt.

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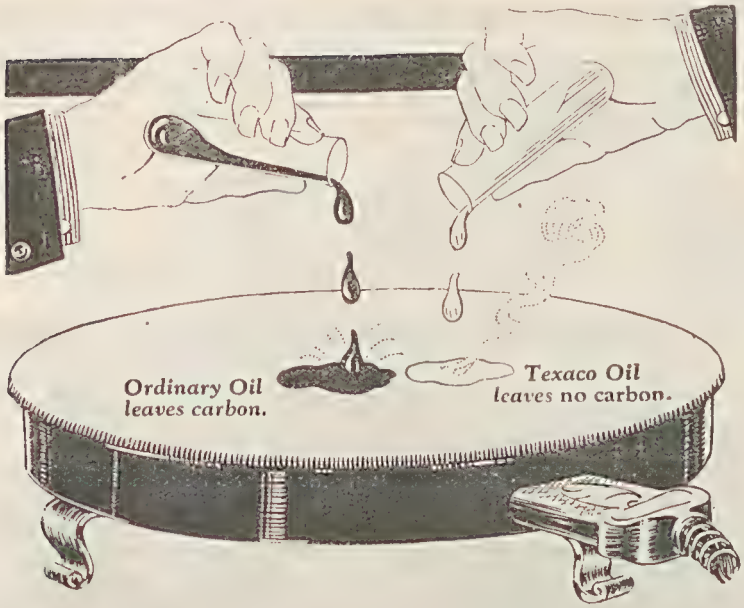

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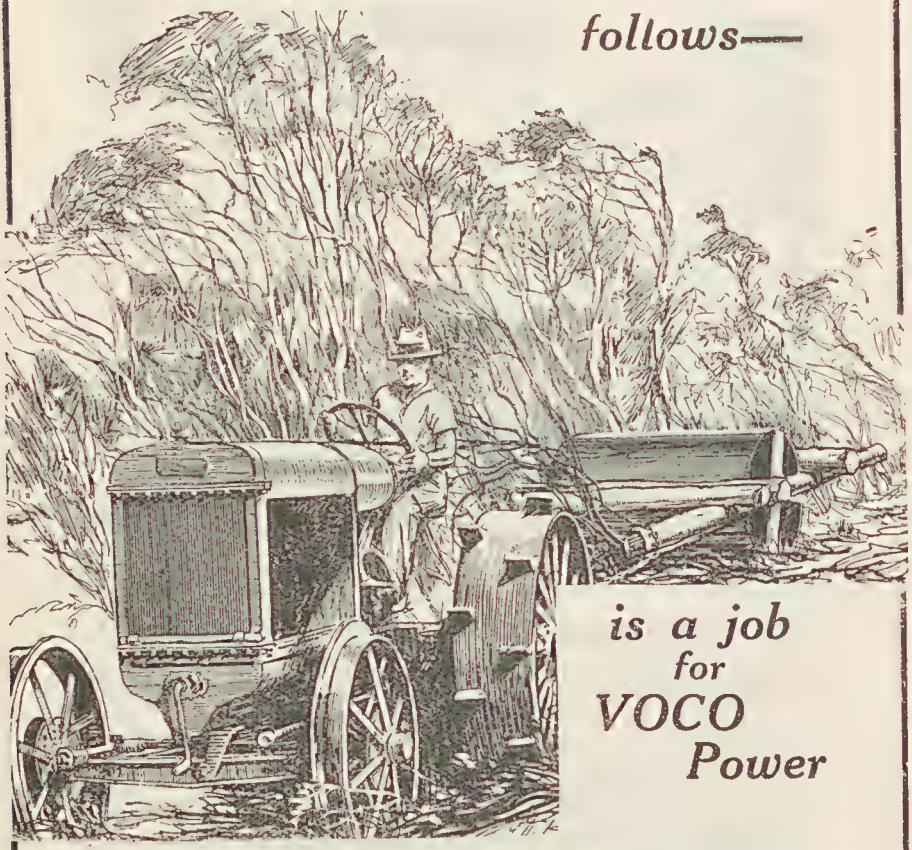

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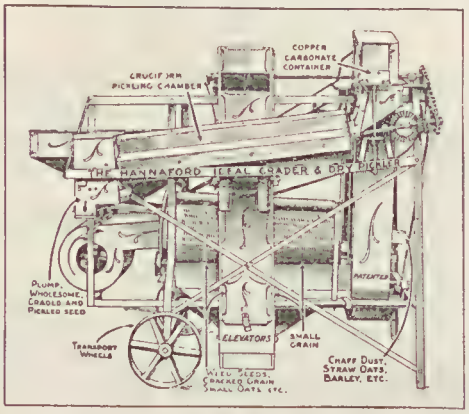

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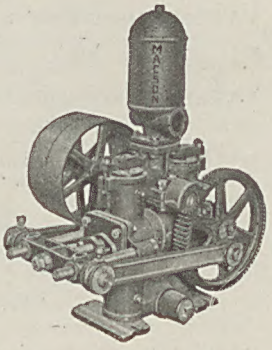

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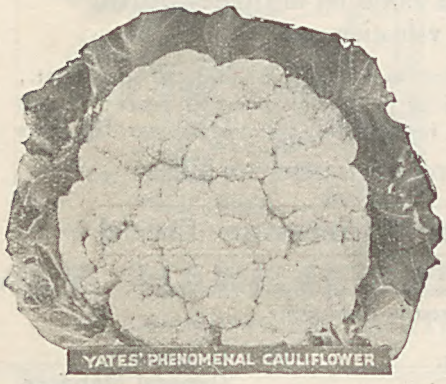

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